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That Will
Revolutionize
Computing

Inside PC Labs
New Benchmark
Tests Find Fast
Windows PCs
Top New Macs
For Web Access

**Speech
Recognition**
Accuracy Up,
Training Time
Down – The Best
Really Do Work



FIRST LOOKS

- Pentium III Notebooks
- FileMaker Pro 5.0
- Apple iBook
- Internet Hard Disks
- Sony Cyber-shot
- AOL 5.0
- LapLink 2000
- MS Works Suite 2000

THE INDEPENDENT GUIDE TO PERSONAL COMPUTING AND THE INTERNET

VOL.18 NO.21 DECEMBER 1, 1999



Testing with
New Internet
And Graphics
Benchmark
Programs

PC Labs Tests 51 of The Best

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COMMUNICATIONS

Performance Does Matter

It seems to be fashionable to knock the PC. Commentators like to talk about how all PCs are too complicated, how they are all alike, and how performance doesn't matter these days. Give me a break. PCs are now and will continue to be the primary vehicle that people use to access and create Internet content.

Why? Because the PC is better at it than anything else. In terms of creating content, there's little dispute about this.

Everything from word processing documents and spreadsheets to graphics and Web pages is produced on PCs. And although I'm a big fan of other kinds of access devices, including PDAs, cell phones, pagers, and set-top boxes, none of these devices are nearly as good for standard Web browsing as PCs. Will other devices gain more functions? Absolutely. But these other devices will do this by working as additional access points, incorporating PCs into their designs, or both.

The same folks telling us that PCs are going away are also saying there's no difference among PCs. Again, we beg to differ.

Sure, if all you are doing is simple Web browsing or running office applications, the differences aren't that great. Among high-end systems, the performance variance on our ZD Business Winstone 99 benchmark tests was less than 15 percent, and you probably won't notice it. But if you're doing more complicated things, such as running Photoshop or a Web creation tool, the differences may be more significant. With this issue, we introduce the benchmark program ZD Content Creation Winstone 2000, which showed differences of more than 20 percent, even among the fastest group of PCs we tested. Older machines are notably slower at such tasks.

If Web browsing is the focus of your PC usage, then you might think all machines are created equal. Think again. True, we've found little advantage so far in browsing using the Pentium III's new SSE instructions (as discussed in our September 21 issue). But our new ZD i-Bench tests, which stress Web-based applications on all sorts of machines, show some very interesting results, particularly when you compare different classes of machines.

Most current machines are quite fast at down-

loading text-based pages. But with more complex pages, there's an extremely noticeable difference. For instance, on Java and VRML tests, similar-speed Athlon-based machines were 20 to 40 percent faster than their Pentium III counterparts. And while the MHz rating of the new Coppermine-based Pentium IIIs isn't necessarily a big step up (733 MHz versus 700 MHz), the faster bus and new chip sets are what put these new machines into the performance lead.

More fascinating is how much better today's Windows-based PCs are than systems from a few years ago on tasks like rendering complex pages. Our fastest computer, a Micron Millennia based on a 733-MHz Pentium III processor and a VIA chip set, rendered a set of complex pages as much as six times as fast as our baseline 233-MHz Pentium II-based machine over our office network.

The tests also showed that the newest Macintoshes—which previous testing has shown are the fastest machines to get you up and running on the Internet—become much slower once you get to the Internet. On an Ethernet connection, as you'd find in your office, the latest iMac took four to six times as long to render a set of complex pages than a less expensive Gateway Astro PC. On a more typical modem connection, as you'd most likely have at home, it still took the iMac more than 50 percent longer to download the pages. (For more details on all these results, see Inside PC Labs, page 33, and our story "Fast PCs," page 100. For more on the benchmark tests themselves, see the Solutions section on page 24 or check out www.i-bench.com.)

Some people will tell you that the PC is going away, that all machines are the same, and that performance doesn't matter in the age of the Internet. At *PC Magazine*, we know better. And I'm betting you do too. **PC**

**How you access
the Web does
matter. A new
Windows PC
blows away the
latest Macs.**



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Michael J. Miller
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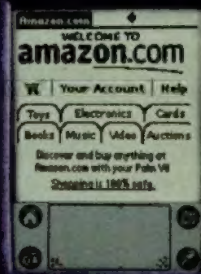


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- Photo-sharing Web sites are fun, easy
to use, and free315

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COVER STORY

100 Fast PCs

A host of technological debuts—700- and 733-MHz CPUs, new memory architectures, and breakthrough graphics—are making this diverse crop of PCs the best performers yet. Here we test 51 of today's fastest machines to see which are best for power users and enthusiasts. *By Jamie M. Bsaies*

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The newest crop of speech recognition software achieves the best accuracy scores we've ever seen. Is it time to ditch your keyboard? *By Greg Alwang*

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Shown here: Presario 1800T Internet Notebook PC.

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3D Graphics with 8 MB Video Memory
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**PRESARIO 1600s
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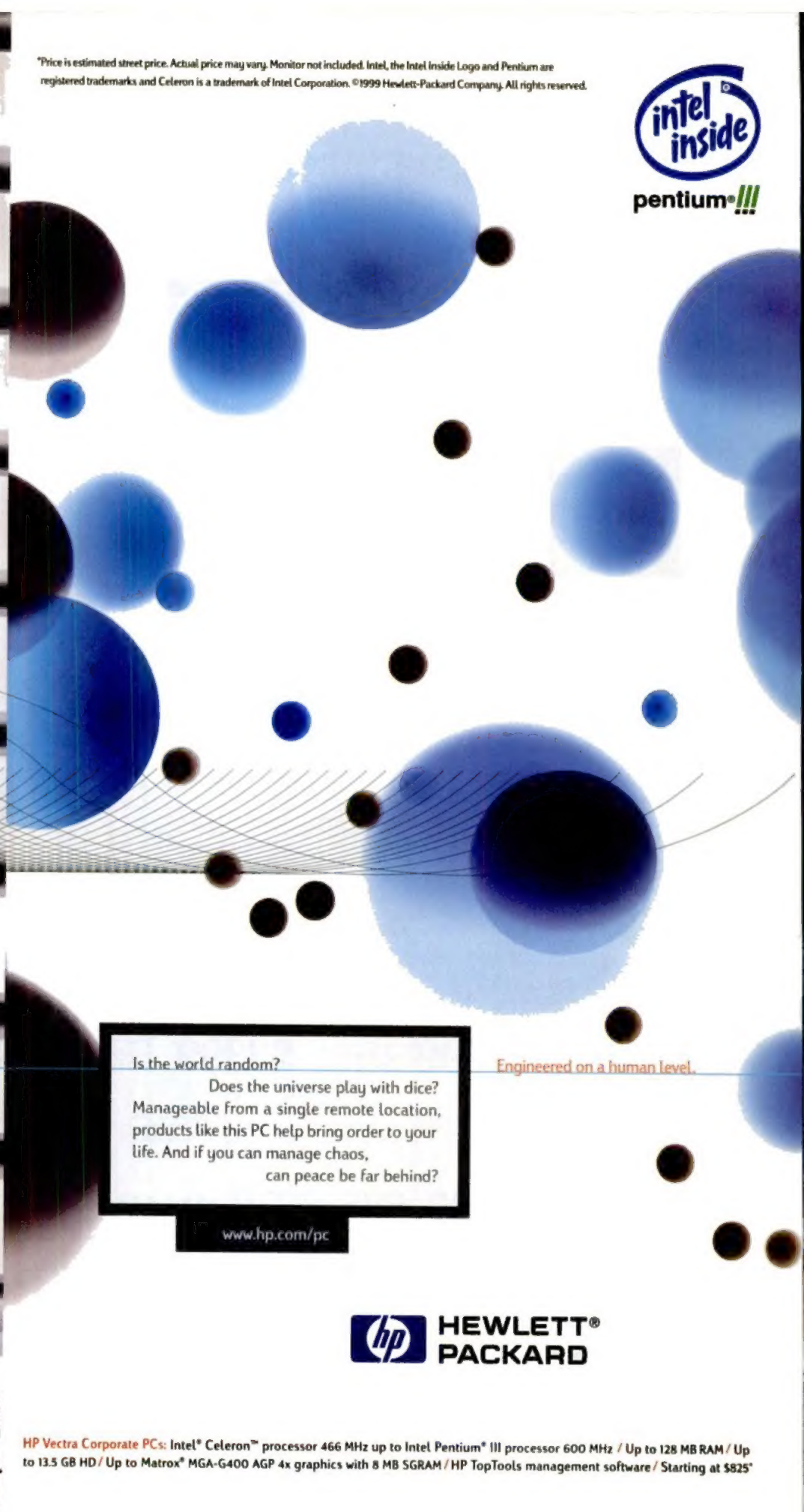
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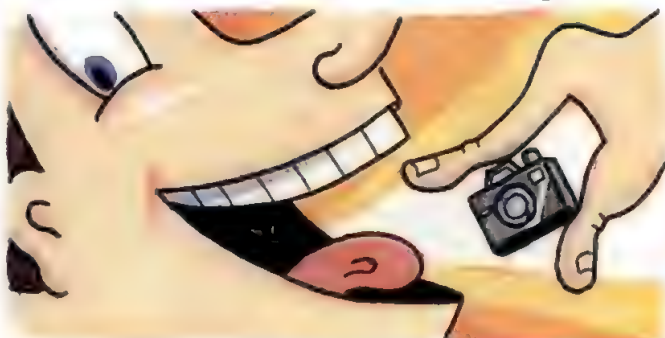


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Camera on a Chip



What if you could shrink all the components of a digital camera to the size and shape of a matchbook? A postage stamp? The buttons on your shirt? The upcoming generation of CMOS-based cameras can conceivably appear in virtually any shape or form and will be used in ways that we can scarcely imagine.

Photobit, a Pasadena, California company that designs and fabricates a wide variety of CMOS sensors, has developed a working prototype of one such unit. Glued directly onto a 1-by-2-inch CMOS wafer—small enough to fit into a wallet billfold—is a tiny, BB-size, fixed-focus lens. On the same chip is a frame buffer, an analog-to-digital converter, and a variety of standard digital camera features and controls such as autofocus, autoexposure control, shutter, and white balance.

The chip also has an interface on its edge for connecting to a parallel cable and port.

The most significant detail of this camera on a chip is its ample space for additional functions. Look for manufacturers to add

lots of extras, including image memory, image stabilization, motion tracking for surveillance, videoconferencing, a battery, and even a wireless modem for remote control and access. The camera can be miniaturized and its cost reduced to a few dollars. When this happens, get ready for an explosion of minicameras.

For instance, a car could include dozens of tiny cameras on its frame, bumpers, hood, trunk, roof, and sides. They'll connect to the car's onboard computer to provide constantly updated information on the car's status, such as when it drifts too close to nearby vehicles. Or the computer could play back images taken just before and during an accident. A camera in the fridge could monitor when you're out of milk or butter and then automatically relay that message to your online grocer. Traffic lights and stop signs equipped with tiny cameras could provide traffic court evidence. And naturally, every cell phone, tape recorder, remote control, clock, and appliance could double as a camera.

For the ultimate personal jewelry, your cufflinks, earrings, or even eyeglasses could be used to capture still images or transmit real-time streaming video. And your doctor might routinely have you swallow a pill-shaped camera to monitor your body parts and functions.



43%

of respondents to a recent PC Magazine Online poll told us they get ten or fewer e-mail messages a day and 7 percent said they get more than 75 messages daily. 32 percent reported that they receive between 11 and 25, and 18 percent said they get between 26 and 75.

Pass the Chips

AMD and Intel converged on the recent Microprocessor Forum conference with dueling chip announcements. AMD's new 700-MHz Athlon processor will be built into IBM Aptiva and Compaq Presario systems. Intel's upcoming Coppermine processors will run at 700 MHz and scale up to 800 MHz.



Coppermine chips are Pentium III chips based on a new manufacturing model and designed to boost speed while lowering power consumption. Intel also said that Itanium is the official name for its 64-bit chip known previously as Merced.

In 2001, AMD plans to debut an Itanium competitor, dubbed Sledgehammer. The 64-bit chip, also called the K8, will be an extension of the x86 architecture, whereas Intel's Itanium will introduce an entirely new architecture.

Instant Know-It-All

Most search engines tend to inundate you with hundreds of irrelevant search results, but the recently launched Gurunet is designed on the premise that less is best. A small, downloadable utility that resides in the Windows system tray when you're connected to the Web, Gurunet (www.gurunet.com) delivers a tight package of quick-reference information.

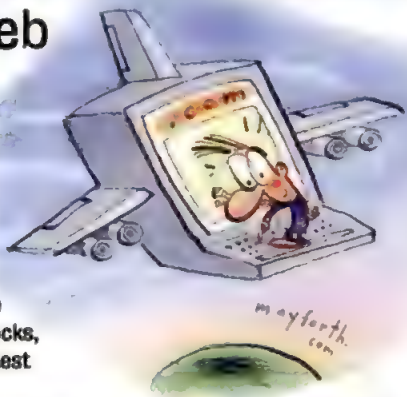
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British Telecommunications (BT) Aeronautical and Excite UK are promising to bring the Internet straight to your passenger seat with an IP-enhanced Skyphone. Most of the content will be cached onboard, with time-critical content broadcast regularly to update the cache. Full access to the Internet will be available via satellite with a 64-Kbps link.

After registering at the My Excite Start Page to receive content such as financial information, news, and horoscopes, you'll be able to view the information by entering a PIN code. BT has also made a deal with Amazon UK to let you buy books while you fly.

You'll also be able to program the seat-back telephone to transfer calls to your mobile phone, enabling you to receive them at authorized times during the flight. The phone service will work within the European GSM standard and will be offered initially by Virgin Atlantic early in 2000. The Internet services should be available next year on 19 airlines, including British Airways, Malaysia Airlines, and Singapore Airlines.

Self-Destructing E-Mail

If you're nervous about sending sensitive information over e-mail, would you rest easier knowing that the e-mail you

that are connected to SMTP-based messaging servers. All messages sent and copies forwarded and archived will expire at the date and time you set.

Recipients don't need to run Interosa to open messages. As they read messages, the application downloads a small Java viewer that confirms the security of the transmission and then displays the message. You can also program the viewer to restrict recipients' ability to



send will self-destruct at your command? Startup QVtech has developed an application that does just that. Interosa runs on Microsoft Windows NT servers

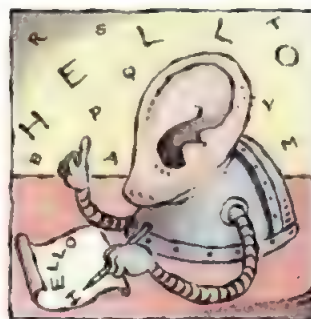
cut, copy, and print messages. E-mail outsourcers such as USA.net and United Messaging plan to offer customized versions of Interosa this year.

THIS ISSUE'S CONTRIBUTORS: Daniel Grotta, Sally Weiner Grotta, Carol Levin, Sharon Nash, Sebastian Rupley.

Superhuman Listener

Can a computer listen better than a person can? Maybe so. University of Southern California biomedical engineers say they've created the world's first computer system that can recognize spoken words better than the keenest human ear can.

The Berger-Liaw Neural Network Speaker-Independent Speech Recognition System is designed to pluck out words from vast amounts of random white noise and even from the background hubbub with which our ears are assaulted every day. The



system is based on neural network technology, which learns tasks through training rather than preprogramming. By studying biological data-processing systems, designers Theodore W. Berger and Jim-Shih Liaw say they were able to build a chip that can mimic the way a human brain processes information.

The technology may be used to improve voice control of computers, assist the hearing-impaired, and aid those who must understand speech in noisy environments and instantly produce transcripts of conversations.

Top-Selling Retail Desktops

1. Hewlett-Packard Pavilion 4535 (\$588)
2. Compaq Presario 5304 (\$481)
3. Hewlett-Packard Pavilion 4550z (\$789)
4. eMachines eTower (\$439)
5. Compaq Presario 5340 (\$677)
6. IBM Aptiva E175 (\$544)
7. Compaq Presario 5360 (\$777)
8. Hewlett-Packard Pavilion 8560c (\$1,083)
9. Hewlett-Packard Pavilion 8570c (\$1,378)
10. Hewlett-Packard Pavilion 8580c (\$1,678)

Source: InfoBeds, September 1999, U.S. market, average selling prices.

Calling a Truce?

America Online and Microsoft may be working independently on building their own instant-messaging communities, but now the two companies have agreed to work together with the IETF (Internet Engineering Task Force), an Internet standard-setting body, to design a common standard for instant messages. That could mean interoperability between products.

The cattiness in the instant-messaging arena isn't over, though. Neither AOL nor Microsoft has resolutely said it will support a common standard, though both say they support the IETF.

The Busiest Web Shopping Day Is ...

It turns out that Wednesday is the busiest day of the week for online buying, which makes it a prime candidate for promotional efforts by Web retailers. Weekends are the slowest shopping days. Maybe everyone's at the mall.

Source: BizRate.com, 1999



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PC Week, February 1999

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ComputerWorld, March 1999

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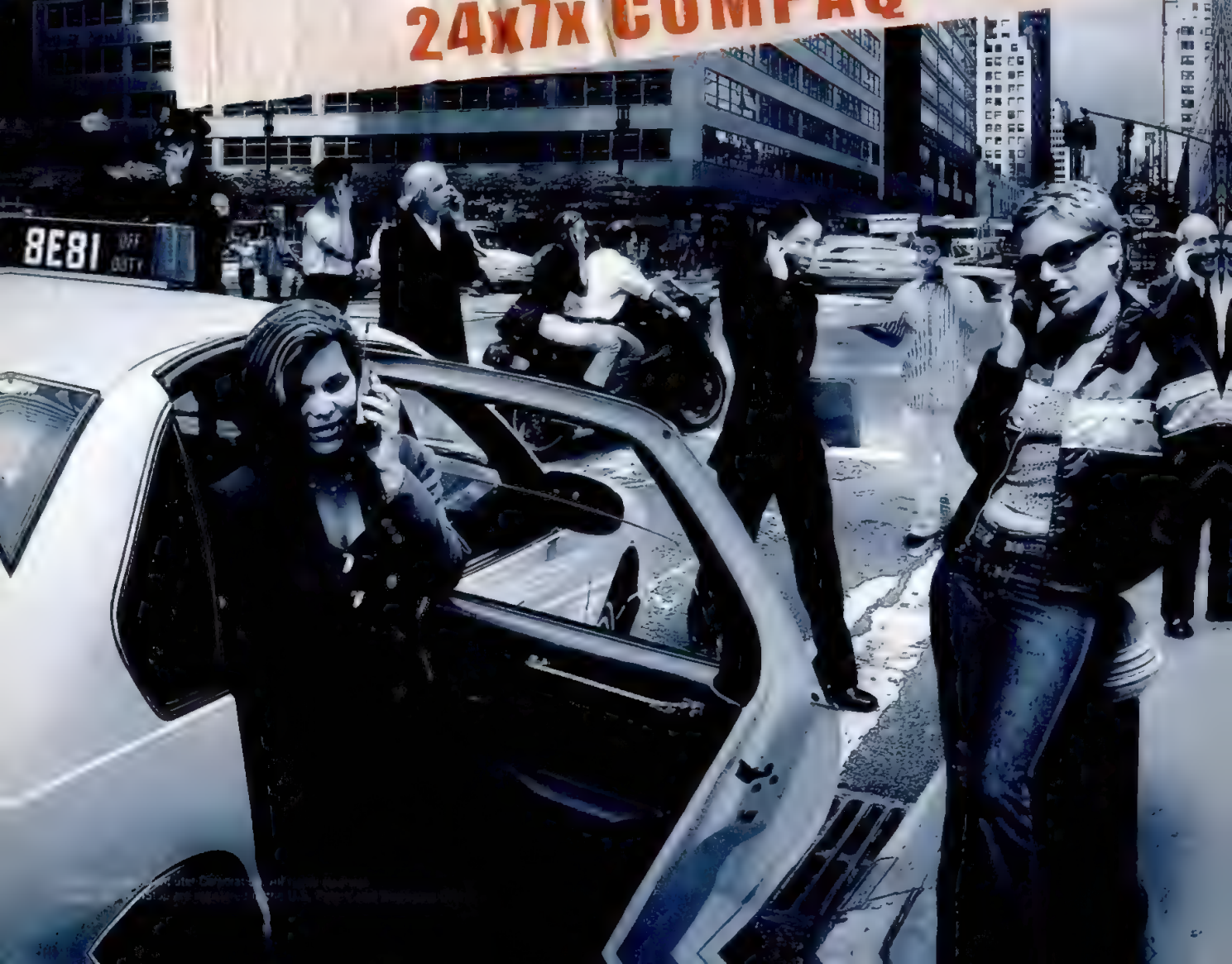
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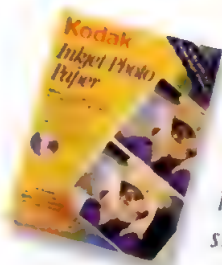
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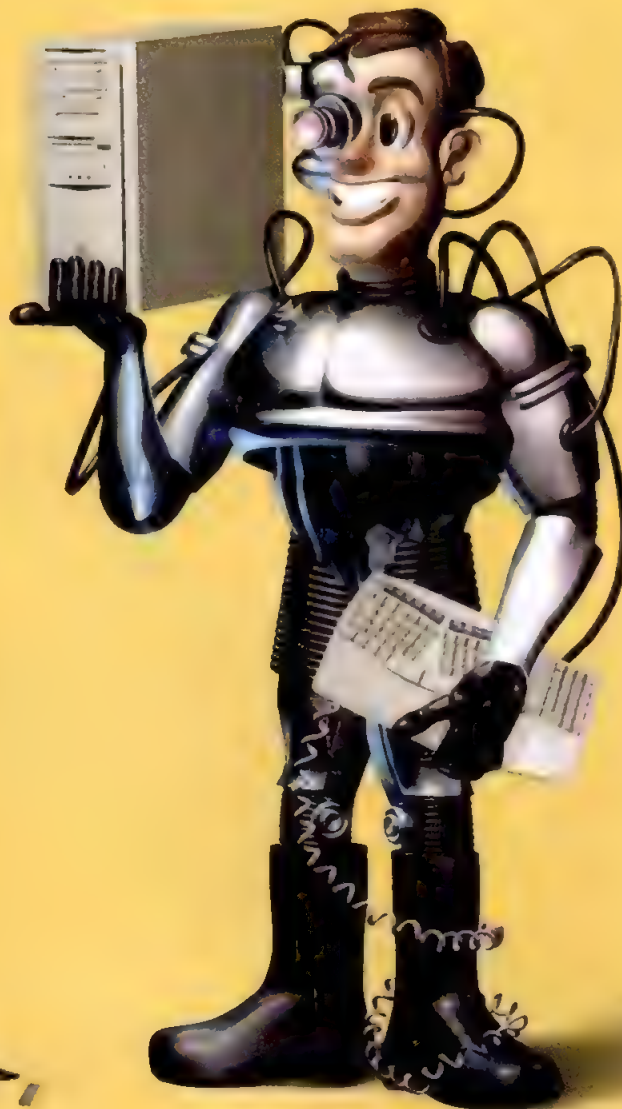
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LETTERS

UNDER THE INFLUENCE

In "The 100 Most Influential Companies" (October 19), there is a chart called "What Makes the Big Sites Run?" According to this chart, not many sites use Microsoft products of any kind. This is not surprising in itself, and I had suspected as much in my dealings with Web hosting companies, all of which seem to run on some version of Unix.

What is surprising is that ZDNet (which I go to all the time) is also on the chart, and I noticed that your Web affiliate doesn't run any Microsoft programs at all. I have always felt your reviews favored Microsoft products.

PETER LUCHSINGE
via the Internet

I took a look at your "100 Most Influential Companies" list, and I must say I was quite annoyed with the patronizing sneer at Corel. Sure, from 1996 to 1997, the company made some boneheaded decisions, but that doesn't justify your comment that "WordPerfect is still out there, although we haven't seen it."

Those who use WordPerfect and read *PC Magazine* know that you despise WP and that you mock StarOffice and any alternative suite that has the temerity to challenge Microsoft Office. Too bad your editors don't use WP as their word processor. If they did, they wouldn't have made that comment. WP is around and will be for a while.

XAVIER BASORA
via the Internet

It was interesting to see your list of the 100 technology companies changing the world. What was more interesting and unimaginable was your exclusion of Qualcomm. Not only is it changing the world of wireless technology, but it will change the world of every one of the 100 technology companies you highlighted—namely, with secure wireless Internet at speeds many times as fast as current land-lined transmission. This will all be coming in the next five to ten years, at the most.

Now I ask you, what could be more exciting, earth-shattering, and influential than that?

ROGER VACHALEK
via the Internet

WRESTLING WITH USB

I read Bill Machrone's column "Peripheral Adventures" (October 19) and have an idea about the "flaky USB behavior" he was complaining about. I've seen a lot of people tripped up by USB when they try to install peripherals. I've seen entire in-house tech-support departments baffled by USB problems.

By far the biggest problem with USB comes, oddly enough, from the BIOS, not the actual port. The majority of users don't realize that their USB ports did

"Qualcomm is changing the world of wireless technology."

not suddenly develop problems but were set up poorly to begin with.

In almost every installation I've handled, the USB port had been assigned the same IRQ as a video card, a network card, the sound card, or something of the kind by the plug-and-play routine. Plug-and-play is still a myth. I still have to go in, wrestle with the BIOS manually, and assign IRQs where I want them. Windows 98 doesn't make that task any easier.

ALEX NUTA
via the Internet

I read Bill Machrone's column, and he just about blew my mind when he said that he paid \$40 for an IEEE1284 cable. Boy, did he get taken to the cleaners! I bought a 1284 cable for the grand price of \$9.85 and could have gotten a gold-tipped one for \$29.95.

I have no idea what brand he bought, but mine's a Belkin. He should've done a little shopping around before he got soaked on a cable.

MRS. R. M. HARDY
via the Internet

3-DEBATE

Regarding "The Future Is DOOMed" (Dvorak, October 19), I'd argue that the future is doomed if we have to navigate a 3-D maze to find a file. Placing files in folders within folders is very similar to a filing cabinet. Contrary to what John C. Dvorak says, it is quite common to put a manila folder in a hanging folder (folders within folders), and this system is quite easy to search. Walking through library stacks and

searching for a book, on the other hand, is not a pleasant experience; it is one that I'd rather not repeat when searching for files on my hard disk. If you can't find a file in two dimensions, I don't see how it would be any easier for you to find one in three dimensions.

DAVID PLAUT
via the Internet

OUT ON A LAN

Bill Howard wrote about using software-based sharing for a cable modem on a network ("We Want It All," October 19). I

looked into this and tried a number of the programs he mentioned. I was very happy to see that Microsoft Windows 98 SE included Internet Connection Sharing in the upgrade, and I bought the upgrade. But I could not get it to work. After digging through the Microsoft support site, I found one sentence to this effect: In order to share a cable connection on a home network, the PC acting as the server must have two LAN cards. Once I'd bought and installed a second LAN

card, the program worked perfectly. It appears you too were misled by the information Microsoft supplies.

KEVIN ELIA
via the Internet

PROTECTION MONEY

In Arnold Brenner's letter (October 19), he says that he has found no way to protect his personal financial data and other personal items from prying eyes without using a second computer. My solution cost me a little over \$150, but I feel it was well worthwhile. I bought a second hard disk and two removable carriers. I set up the second disk with a complete operating system and all the programs I use and don't want anyone to be able to touch. It's set up to dial only my bank for my bill payment. The operation works well by swapping disks when I want to pay bills or enter checks into QuickBooks.

CHUCK ENDICOTT
via the Internet

E-MAIL SHARING

In reference to your response to the letter written by Gentry Wade in the October 19 issue ("Share and Share Alike"): You can share an e-mail folder in Outlook, Outlook 98, or Outlook 2000 on more than one computer (but not Outlook Express). Delete the file Outlook.pst on the networked computer and you'll be asked if you want to find the file yourself when you start

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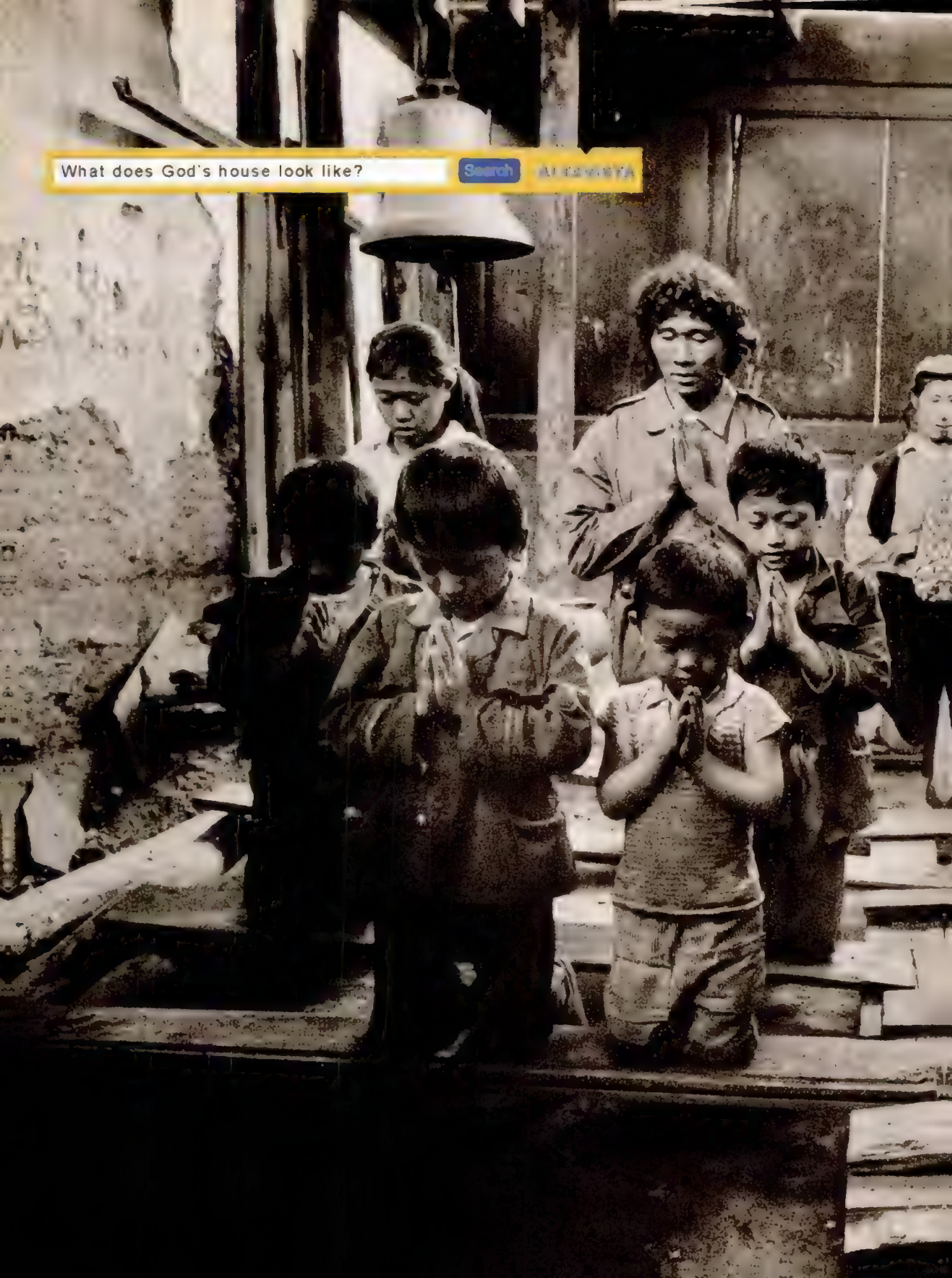
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the program. Just point to the networked Outlook.pst file on the other computer. The only caveat is that only one of the computers can have the file open at any given time.

LARRY STEWART
via the Internet

I wrote this letter at a coworker's desk from my e-mail account. My e-mail is currently open on my desk in another office. After I send this, I'll go back to my desk and this letter will be in my Sent folder. I could be using an incredibly expensive e-mail server package with Outlook, or I could be using something we developed at a high cost to our company—but I'm only using Pegasus Mail. It has its oddities, but it works. And its oddities can be accommodated for the noncorporate user.

KARL OEHLING
via the Internet

GAMES PEOPLE PLAY

I have to take issue with the comments of Jake Kirchner with respect to the state of today's computer games ("Finally, Some Reality Comes to Computer Games," October 19). Kirchner states that "most computer games today are just flat images sliding around on a small piece of glass" and further insults gamers by calling games "so phony, so unreal, as to be laughable." Movies are just flat images displayed on a large screen. Television shows are flat images displayed on a smaller screen. Is this some problem most of us aren't aware of? We seem to spend a lot of money on such "laughable" endeavors.

Has Kirchner ever played games of any kind? Chess, I suspect, he would sum up as a boring set of similar pieces laid out on an unimaginative board of alternating colors. Well, in this case I find his column to be nothing more than plain old black ink wasting away on a standard piece of worthless paper.

RICH HEIMLICH
via the Internet

WEB REALITY

Your recent article "Web Portals and Search Sites" (October 5) brings into sharp focus the expectations gap between your editors and the general public. The article depicts an Internet utopia where customized Web and Web-based applications combine to make everyone's life so much better. As we non-computer science majors know, the reality is quite different.

The reality of the Internet is this: Connections are slow and unreliable, the buggy software makes your PC crash, and online hucksters greedily gobble up the information that you provide to Web sites. The Internet has a long way to go before it becomes truly useful for John Q. Public. For now, it's still in beta.

STEVEN LESSER
via the Internet

Corrections and Amplifications

In "Feel the Force" (After Hours, September 21), the price of the V4 Force Feedback Racing Wheel should have been \$129.99 instead of \$40. The FX Force Feedback Racing Wheel is \$40, as indicated.

In our story "19-Inch Monitors: The Big Picture" (October 19), we gave the wrong street price for the ViewSonic PT795. The correct price is \$760.

In our story "The 100 Most Influential Companies" (October 19), we misstated the ticker symbol for PC Connection. It should have read PCCC, not PCC.

How come you always leave out the best little search engine this side of the Mississippi? Apparently you have never heard of Dogpile (www.dogpile.com).

Your article listed 15 so-called top search engine sites. Dogpile uses 6 of those sites (About.com, AltaVista, GoTo.com, Looksmart, Lycos, and Yahoo!), plus 6 others (Dogpile Web Catalog, Dogpile Open Directory, Direct Hit, Lycos Top 5%, Infoseek, and RealNames). These searches are done through Web Metasearch. You can also do FTP, Usenet, and Web Catalog searches. If these aren't enough, Dogpile advises the searcher to try either Amazon.com or Electric Library. You ought to try Dogpile sometime—before the next millennium passes you by.

JIMMY BAILEY
via the Internet

RETURN MAIL

Your review of E-Stamp Internet Postage in "The Web as a Post Office" (First Looks, October 5) has one serious omission. Nowhere in your article do you state that Microsoft Internet Explorer is required.

E-Stamp's own omission is on the verge of deceptive. Neither at its Web site nor on the product box does it state that IE is required. Rather, it claims that the product works with the most popular Web browsers and is satisfied with the disclaimer that the product requires "19MB of hard disk space, plus 57MB if Internet Explorer 4.01 is needed."

I contacted E-Stamp's technical-support department to see whether installing separate elements, such as the Microsoft Java Virtual Machine, MDAC, or Windows Messaging, would enable me to install E-Stamp. Its answer was that IE and E-Stamp were bundled so tightly that E-Stamp would not work without IE. Anyone who removes IE from a system and tries to install E-Stamp will soon discover that IE is mandatory.

H.R. WHITE
via the Internet

MANY MONITORS

The "Multiple Monitors" tutorial (Solutions, September 21) touts the advantages of using more than one monitor in a system. Surprisingly, there was no mention of a single-slot multiple-monitor card as a possible solution for the user. A multimonitor card is slightly more expensive than two single monitor cards, but it provides several added benefits.

- **Accommodation.** As your article makes clear, installing two graphics cards will fill precious IRQs and PCI or AGP slots. A multi-monitor card uses the same space and resources as a single-monitor card. It also eliminates the need to "give the system a try" to see whether two cards are compatible.

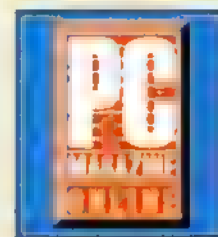
- **Support.** A company that manufactures single-monitor cards may not have the experience or resources to help troubleshoot problems with a multiple-monitor configuration, whereas a company that designs cards specifically for such use will have a technical staff familiar with the issues and will provide better support.

- **Productivity.** Look for a card that comes with desktop management software or special hardware enhancements. Monitor synchronization, for example, which only multiple-monitor cards offer, can eliminate the eye-strain caused by electromagnetic interference. Consider DirectX and OpenGL acceleration across monitors, Windows NT 4.0 support, and optimized multimonitor drivers.

Your suggestion about using two cards may be the least expensive, but if productivity is the real motive, then buying one dual-monitor card will be a more cost-effective solution.

RICH CLARK
via the Internet

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The Hand-Held Shopping Mall

Get ready to shop till you drop with your wireless phone or PDA.

Instead of doing all your online errands while hunched over a PC, why not do them over the phone? Personalized shopping and information services coming straight from the Web to your cell phone or PDA may finally become a reality. Big players such as America Online, Microsoft, and Yahoo! have all promised to fine-tune their services for portable devices, and every day seems to bring another announcement from a hardware or portal company promising to bring personalized data and shopping to hand-held devices.

Wireless e-commerce is still in its infancy, but developers are working overtime to make their offerings suitable for the tiny screens on phones and PDAs. Many of them are also promising to tailor the information to your physical location when you're connecting to the Web from your portable device. And the surge expected in the adoption of wireless devices and the Wireless Application Protocol (WAP)—a protocol for reformatting Web pages to fit tiny screens—suggests that wireless e-commerce is here to stay.

Wireless services are likely to be more popular for portable phones than for palm-size organizers, according to Jupiter Communications. According to its projections, the number of users of browser-enabled mobile phones will soar from 1.1 million this year to 79.4 million in 2003, whereas Internet-capable PDA users will only increase from 5.2 million to 12 million in the same period of time.

Portal companies are among the most eager to enter the wireless e-commerce market. Excite@Home recently teamed with AirFlash, a mobile portal company, to bring personalized content that's specific to your location directly to your mobile phone. After registering your personal details and interests at the Excite Web site, you'll receive wireless content specifically tailored for your particular device and location. You'll be able to get lists of ATMs, copy centers, gas stations,

hotels, restaurants, and shopping information.

AirFlash says the information will be customized in terms of accessibility as well as location. "We've created a search technique that provides the same cognitive process that you would go through in balancing convenience and distance," says Glenn Gottlieb, a vice president at AirFlash. For example, the nearest movie theater may be only a few hundred yards away, but it might require crossing a bridge or going through heavy traffic. The service would recommend another theater that may be farther away but is more accessible.

IBM and Nokia have also formed a partnership to deliver wireless e-commerce content, based on WAP, to portable devices. "If you want to use a mobile phone instead of your PC to access the Internet, WAP is the key," says Mark Bregman, general manager of IBM's Pervasive Computing division.

Meanwhile, Amazon.com recently launched Amazon.com Anywhere, a wireless e-commerce service that will let you shop on your Palm VII. Your screen will display a simplified version of the Amazon site that lets you

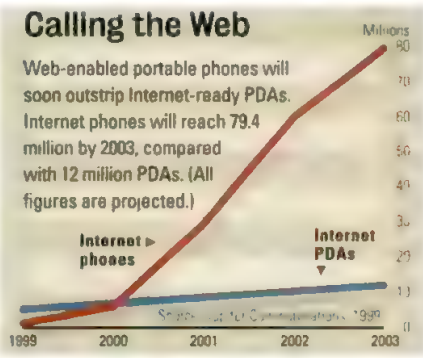
shop for toys, electronics, books, music, and videos, as well as check the status of your Amazon auction bids. Rather than browsing for products, you'll key in specific queries. The service will respond with the top three choices available at that time.

There's also been a recent flurry of activity on the wireless hardware front. Microsoft CEO Bill Gates recently demonstrated a prototype Windows CE-based smart phone with a built-in Internet browser and a color display. Earlier this year, Microsoft acquired STNC Enterprises, which has been working on a next-generation microbrowser. And Microsoft recently joined with British Telecommunications to develop hand-held wireless devices based on Windows CE. Meanwhile, the Symbian consortium—composed of Ericsson, Matsushita, Motorola, Nokia, and Psion—recently teamed up with 3Com to develop Internet phones based on the EPOC operating system, a rival to Windows CE.

Industry insiders admit that the market for these services is just beginning to gain ground and the services are unlikely to work smoothly right away. Says Seamus McAteer, an analyst at Jupiter Communications: "The notion that you'll be able to get location information from your cellular provider is great in theory, but it will involve substantial integration in practice." —Sharon Nash

Calling the Web

Web-enabled portable phones will soon outstrip Internet-ready PDAs. Internet phones will reach 79.4 million by 2003, compared with 12 million PDAs. (All figures are projected.)



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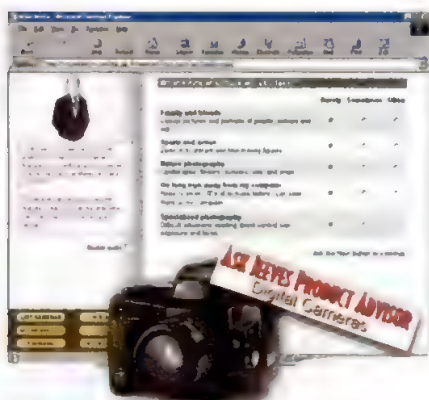
The Web as Personal Shopper

Consumers are expected to spend \$6 billion online during this holiday season, almost double the \$3.1 billion spent last year in the same time period, according to Jupiter Communications. But there's still a large untapped market out there—people who browse but are reluctant to commit to buying. Here's how e-tailers are planning to tackle that problem.

To remedy the lack of personalized assistance on the Web, Ask Jeeves's new Shopping Advisor provides a big dose of customer hand-holding. It uses a question-and-answer dialog tailored to the specific online store you're in. You respond, and it tries to find the products that best meet your preferences.

Ask Jeeves is aiming the service at consumers and businesses that need to research complicated products such as electronics, computers, office equipment, home appliances, as well as travel and leisure services. A consumer electronics site called etown.com is one of the first sites to use Shopping Advisor.

To assist in the price-comparison depart-



ASK JEEVES: The Shopping Advisor asks simple questions to help find the products you want.

ment comes a new product from flyswat, a Web search company, and mySimon, a comparison-shopping site. The downloadable app instantly compares prices for any product mentioned in any Web page you visit.

Once mySimon's version of flyswat is installed, products on Web pages are highlighted as flyswat links, called *flycons*. You click on the title and get a pop-up menu that includes a link to the mySimon Web site, where you can review prices, shipping costs, and shipping times.

R U Sure is another comparison-shopping tool that recognizes when you're shopping online and notifies you of lower prices. The downloadable app supports many popular shopping sites, including Amazon, CDNow, and CompUSA.—Sharon Nash



Test the Net with i-Bench



Is a fast pipe all you need to surf the Web quickly, or do you need a fast PC as well? Does it make a difference whether your system has the latest processor, or do all PCs perform equally well when downloading pages?

To answer these questions conclusively, we worked with ZD Labs to create a new benchmark program, called i-Bench, to test the speeds and capabilities of different systems, browsers, and operating environments.

Unlike our other benchmark programs, i-Bench isn't designed for any particular operating environment. It is essentially a series of Web pages; it can run on just about any machine that has a browser, and it can test all sorts of Web-based tasks. With i-Bench, you can assess your browsing environment's speed at loading simple and complex HTML pages, executing Java applets, playing back video in various formats, running Flash or Shockwave animations, and running VRML worlds. i-Bench also provides tools for testing various Internet capabilities, such as how well your browsing environment can handle video and audio, 3-D modeling and images, and XML. It also tests for compliance with the HTML 3.2 and 4.0 standards. (For details, see the Solutions section in this issue or www.i-bench.com.)

To introduce i-Bench, we concentrated on the most popular operating platforms and browsers in conjunction with this issue's evaluation of fast PCs and our First Looks evaluation of Apple's new iBook and iMac models. We also tested a variety of older, slower PCs.

The results, summarized in the table below, confirm that a fast Windows PC is the best type of system to use for Web surfing today. Our results using Ethernet connec-

tions revealed the following:

- Today's fastest Windows-based desktop systems were able to complete certain tests, such as loading a set of complex pages, as much as six times as fast as our baseline 233-MHz Pentium II desktop. Much of the difference is due to memory, chip set, system bus, and peripheral enhancements, but some of the difference is due to the processor.

- The system fastest at loading pages was a 733-MHz Pentium III model with a faster bus and the new Via Apollo Pro 133a chip set. It shaved 11 to 13 percent off the timing of a 700-MHz Athlon machine. But the Athlon was slightly faster at running our Java-based test, which is processor-intensive.

- When loading text-based pages, our 600-MHz Athlon-based system shaved 19 percent off the timing of our 600-MHz Pentium III, although in loading complex pages this figure was only 9 percent.

- On Windows PCs, Microsoft Internet Explorer 5.0 was between 20 percent and 25 percent faster than Netscape Navigator 4.7 at loading complex pages on most systems.

- On the Apple iBook, Navigator 4.7 outperformed IE 4.5 significantly in loading complex pages, although IE was faster at typical text pages.

- In general, Windows-based PCs were much faster than equivalent Macs on all tests. Gateway's Astro was roughly four to five times as fast as the iMac at downloading text and complex pages. The difference over a dial-up connection was less, but still the Astro was 50 percent faster than the iMac.

Browsers update frequently, so performance results are always changing. Fortunately, with i-Bench you can evaluate your system's Internet performance any time you want. It's available for download on the Web at www.i-bench.com.—Michael J. Miller

▲ High scores are best. ▼ Low scores are best.			Load Text-Based Pages (seconds) ▼	Load Complex Pages (seconds) ▼	Java VM ▲
Bold type denotes first place					
iBook (IE 4.5)	G3/300	64MB	135	281	23,872
iBook (Navigator 4.7)	G3/300	64MB	147	112	N/A
Dell Dimension XPS	Pentium II/233	32MB	69	102	16,662
IBM Aptiva	AMD K6-2/400	128MB	36	40	20,424
IBM Thinkpad iSeries 1480	Celeron/466	64MB	42	42	43,766
IBM Thinkpad iSeries (Navigator 4.7)	Celeron/466	64MB	97	66	39,522
iMac (IE 4.5)	G3/400	128MB	87	130	31,122
Gateway Astro	Pentium III/550	64MB	20	25	53,286
Gateway Performance	Pentium III/550	128MB	18	23	53,846
HP Pavilion 8500	Pentium III/600	128MB	21	23	58,532
SYS Performance 600A	AMD Athlon/600	128MB	17	21	71,794
Falcon Northwest Mach V	AMD Athlon/700	128MB	16	19	80,577
Micron Millennia Max	Pentium III/733	128MB	14	17	77,586

All PCs were running Windows 98 and IE 5, unless otherwise noted; we tested the iBook with Mac OS 9.0.

N/A—Not applicable. The Java VM in the Macintosh version of Netscape 4.0.4 does not support the Java 1.1 classes required by i-Bench.

DESKTOPS

iMac Overhaul

Apple CEO Steve Jobs has served up three new additions to the company's line of iMac computers and also introduced a new operating system. The new iMacs cover some new territory, including desktop video editing, multiple USB ports, different casing designs, and enhanced audio features. The systems will ship initially with Mac OS 8.6 but will shift to Mac OS 9.

The new designs are smaller than previous versions, and a rear-entry door is built in for easier memory upgrades and for adding the Apple AirPort card (\$99 list) for wireless networking and Internet access. (The AirPort technology was introduced with Apple's iBook notebook computer announcement.)

Of the three models announced, one will sell for \$999 (list) and include a 350-MHz G3 processor, a Rage 128 graphics processor,

► **MAC ATTACK:** At the iMac announcement, Jobs said, "The day after we shipped the original iMac, we started working on all of this."

64MB of RAM, a 6GB hard disk, two USB ports, and a 56-Kbps V.90 modem. The AirPort wireless networking will cost extra.

The second new iMac model (\$1,299) will feature a 400-MHz G3 processor, a 10GB hard disk, a DVD-ROM drive, FireWire (IEEE 1394) connectivity, and Apple's new iMovie software for desktop video editing. Jobs says he sees a very bright future for desktop video.

The third iMac model will sell for \$1,499 and include 128MB of RAM, a 13GB hard disk, and new design effects, including a gray graphite texture on the outside casing.

The iMac line has been a success for Apple. According to PC Data, about 2 million iMacs have been sold, and they are the top-selling desktop computers in the retail market. This has doubled Apple's market



share at retail to 11.2 percent.

It's also encouraged other PC makers to focus on new designs and ease of use. For example, Gateway's new \$799 Astro offers the same kind of easy setup as the iMac, and it goes beyond the new iMacs by including four USB ports. Packard Bell NEC is also focusing on racier designs and ease of use in consumer systems.—Sebastian Rupley

You Only *Think* You Understand the Internet Age

Is your company doing all it should to respond to the challenges of the Internet era? Almost certainly not. I'm confident the answer to that question is no, because I see so many companies behaving as if meeting the Internet challenge requires no more than creating a Web site through which to disseminate information and sell products. In effect, they apply a thin veneer of customer-oriented information technology over a corporate organization and mentality that are rooted in a hundred years of post-Industrial Revolution business practices. They think they can do everything—planning, manufacturing, shipping, and customer service—the same old way if they just do it faster via the Internet.

The real task is much bigger: to use Internet-based technologies in fundamentally changing the way your company is organized and how it relates not just to your customers but to suppliers, partners, and employees. I've been thinking about this a lot recently as we set our budget and plan our editorial coverage for the coming year. We say the Internet changes everything, but have we changed sufficiently in the process? Have we done enough, and are we moving quickly enough? Probably not.

Another person thinking about this long and hard is Douglas Aldrich, vice president and managing director of the global information technology practice at A.T. Kearney, the management consulting firm. His new book tackles the subject head on. "Digitization for the sake of digitization" is not only insufficient for future success, it's a trap, he says in *Mastering the Digital Marketplace*:

Practical Strategies for Competitiveness in the New Economy (John Wiley & Sons).

Instead, Aldrich says, companies need to focus on their core competencies and rely on computing and especially communications technologies to create what he calls "value-based organizations." These rely on a constantly evolving mix of partners to provide the greatest value of products and services to their customers. This kind of organization is the antithesis of what most corporations are trying to manage and grow today, in his view.

Aldrich dropped by my office the other day to discuss his theories and his new book. What fascinates me the most about his ideas is that today's trends take him to the extreme realization that "the digital economy is about one thing: information." He means that this applies to every business, no matter what product or service it provides. Soon only the digital content will distinguish your products from those of your competitors, and your ability to use digital technologies to create a community around your product and services will make or break you.

Think of how PC makers use Internet access and other services as key competitive advantages, rather than the hardware itself, and you'll have a glimpse of the future. It's one in which you may choose one oven or car over a competitor's machine based on their relative abilities to respond to voice input and connect you immediately with customer service.

Every industry will come to the same realization, he says—some sooner than others. He adds that even some of the technology leaders are still missing the point. "The bane of the technology field is that there is an arrogance bordering on insanity," he told me. The attitude is, "If we're doing it, it must be right; if not, it must not be important." No doubt all of us have some painful lessons ahead.



Jake Kirchner

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INTERNET

The Digital You

Web stores are challenged to find ways to turn browsers into buyers. Too often, potential buyers are turned off by all the long registration forms asking nosy questions and by seemingly endless order forms. According to Jupiter Communications, 27 percent of online consumers abandon the items they put into a shopping basket because they find filling out the necessary forms a hassle. And according to a recent *Business Week/Business Week/Harris Poll*, 77 percent of Internet users haven't purchased a single thing online. Of this group, 86 percent cited lack of privacy as the most important reason for their nonbuying habits.

That's starting to change with initiatives from Microsoft and Novell, each of which is a variation on the same theme: giving Web users a digital identity card they can use to fill in registration forms and supply credit card and shipping information to Web sites automatically.

With Microsoft's Passport, which has been in testing since the summer, you first create an account by—guess what?—filling out a form. But that's the end of all the forms. As long as you shop at Passport-enabled sites, your Passport account will be accepted. To purchase goods at any participating site, you select a credit card and shipping address from your Passport wallet. Passport then encrypts and securely transfers the information to the merchant for transaction processing.

Merchants, who pay Microsoft an annual service fee based on Web site traffic, can implement the service by incorporating a Passport link into their sites and retrieving data posted from the Passport server. The service currently has a network of 50 Web merchants.

Whereas Passport works only at participating sites, Novell's digitalme works not only at sites that are already digitalme-enabled but also at sites that aren't. If a site is digitalme-enabled, then whenever your personal data changes, all the digitalme-participating sites will be updated. For sites that aren't enabled, digitalme will take its best shot at filling out registration forms.

Billed as an "identity management" service, digitalme leverages the Novell Directory Services to simplify Web shopping. According to Novell research, online users must remember an average of four passwords, and less than one user in five remembers to notify



a Web site when personal information changes. Digitalme stores your passwords, user names, account numbers, bookmarks, and preferences. Your "vault" is stored remotely on digitalme servers so you can access it

wherever you happen to be.

After you fill out a Master Profile at www.digitalme.com, every time you want to register with a new site digitalme intercepts the registration forms, fills them out, and presents them to you for review. Novell plans to introduce additional services around its digitalme platform. To jump-start the development of services, the company plans to make the source code available on the digitalme site.

Other Web account keepers include CyberCash, which launched its InstaBuy service last summer. You can sign up for a free electronic wallet at any InstaBuy-enabled site or at www.instabuy.com. Once you register and supply your billing information, you can use the one-click service at more than 100 participating Web merchants. And Qpass's PowerWallet fills in any registration form on the Internet, manages online receipts, and keeps track of your user names and passwords.—Carol Levin

INTERNET

The Multicultural Web

Market researchers love to probe the collective psyche of Web users to uncover their likes, dislikes, shopping habits, education levels, incomes, and just about any other potentially valuable demographic tidbit. One of the latest surveys from PricewaterhouseCoopers reveals the differences among Web users in the U.S., France, Germany, and the U.K.

One big difference is that consumers in the U.S. spend almost twice as much time online as do their European counterparts: 5.3 hours per week on average in the U.S., compared with 2.4 hours per week in Europe. U.S. consumers are also willing to spend more on Web purchases than their counterparts in Europe. U.S. buyers said they are comfortable spending around \$295 for a single online purchase.

Accessing the Internet from home is more popular than ever. Forty-three percent of U.S. users now have home access, compared with 17 percent of European users, according to the survey. Access speed is most important to U.S. users, while Europeans are more concerned with access costs. Most Internet connections are still made via regular telephone lines.

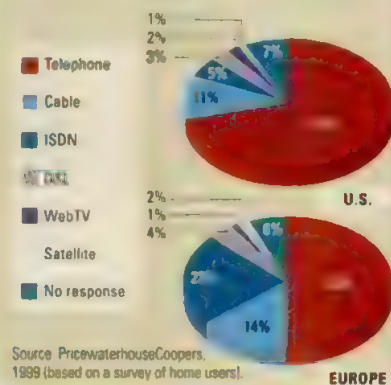
Online music is popular across the board, with one-quarter of all those polled saying they download music from the Internet. It's still not clear whether these downloads are encouraging people to buy music. Sixty percent say that downloading music encouraged them to buy CDs. Half of those surveyed, however, say that downloading music saved

them from having to buy music.

The online activity of choice for most U.S. home users is now sending and receiving e-mail (rather than last year's favorite: information retrieval). In the U.K., these two activities are tied, although German and French consumers favor information retrieval. And what if the Internet disappeared tomorrow? Most American and Europeans say they would watch television or read. The French would prefer to listen to music, go out, or spend time with their families.—Sharon Nash

Web Access Ramps

The plain old telephone is still the method of choice for accessing the Web in the U.S. and most of Europe, according to PricewaterhouseCoopers. ISDN access, however, is popular in Germany—preferred by 49 percent of those with home Internet access.



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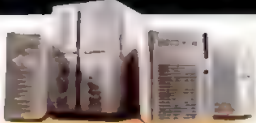


Results based on a PC Magazine (July 1999) "Desktops and Notebooks Service and Reliability" survey in which Quantex received an "A" rating in the Desktops—Overall Use category, beating out Gateway and Compaq which received ratings of "C" and "D" respectively. Quantex received an "A" rating by scoring significantly higher than average in all 5 test categories. See PC Magazine July 99 for details.

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Internet-ready, Multi-function Keyboard, MS Mouse
Microsoft Office 2000 SBE

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QUOTE NUMBER: pcm12s34

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Awesome Performance, Great Price

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New 4x Max Variable Speed DVD-ROM Drive
Aureal Vortex2 Sound, A3D 2.0 Technology
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Corel WordPerfect Office 2000

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Business lease starting at \$63/Mo., 36 Mos.

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Intel® Pentium® III Processor 500MHz
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104-Key Keyboard, MS Mouse
Corel WordPerfect Office 2000
Canon BJC-2000 Color Printer w/IS22 Scanner Included!
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\$1329

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104-Key Keyboard, MS Mouse
Corel WordPerfect Office 2000
Canon BJC-1000 Color Printer Included!

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QUANTEX W-1511

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MS Windows 98 2nd Ed., Microsoft Office 2000 SBE
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QUOTE NUMBER: pcm12w03

QUANTEX W-1410

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Integrated 3.5" Floppy Drive
New Mini-PCI 56K Fax/Modem
Integrated Stereo Sound and Speakers
New ATI Mobility P Graphics w/8MB; TV-Out
MS Windows 98 2nd Ed., Corel WordPerfect Office 2000
Quantex Deluxe Carrying Case Included!

\$2499

Business lease \$91/Mo., 36 Mos.

QUOTE NUMBER: pcm12w01

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Affordable Portable Power

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Modular 4x Max Variable Speed DVD-ROM Drive
Modular 3.5" Floppy Drive
56K V.90 Fax/Modem
Integrated Stereo Sound and Speakers
New ATI Mobility M Graphics w/4MB
MS Windows 98 2nd Ed., Corel WordPerfect Office 2000
Quantex Carrying Case

\$2299

Business lease \$83/Mo., 36 Mos.

QUOTE NUMBER: pcm12t24

QUANTEX T-1330

Affordable Portable Power

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32MB SDRAM Memory
4GB Ultra ATA Hard Drive
Modular 24x Max Variable Speed CD-ROM Drive
Modular 3.5" Floppy Drive
56K V.90 Fax/Modem Included!
Integrated Stereo Sound and Speakers
New ATI Mobility M Graphics w/4MB
MS Windows 98 Second Edition
Quantex Carrying Case

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Business lease \$62/Mo., 36 Mos.

QUOTE NUMBER: pcm12t27



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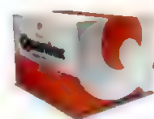
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Living the Freelance Lifestyle

By Alan Cohen

Ah, the freelance lifestyle: Sleeping late, reading the paper, solving crimes each afternoon with *Quincy*. And in the evenings, cranking out the work that pays the bills. It's nice to set your own hours and avoid office politics. But freelancing can bring feast or famine; it can also mean long days at home, no colleagues to gossip with around the water cooler, and no water cooler, either. Then there are the nitty-gritty issues: finding health insurance and planning for taxes. If you're thinking of going solo or are already there, you'll want to check out the following sites.



Bringing Home the Bacon

➤ Talent may be something you're born with, but work is something you need to go out and get. A pair of Web sites tailored specifically for solo practitioners simplify things. **Monster Talent Market**, at career megasite **Monster.com** (www.monster.com), takes an innovative approach: the freelancer auction. Here you can post your resume along with what you're looking for and what you'd like to be paid. Prospective employers then bid for your services. The Talent Market covers a host of job categories from lawyer to Web designer, and your contact information isn't made available until you accept a bidder's offer. Accepting a bid doesn't end the story; it simply links two parties who might be able to help each other. When we looked at this site, most sellers had yet to receive a single bid, but once the Talent Market gets rolling it should be an excellent resource.

Also promising, if a little old-fashioned, is **FreeAgent.com** (www.freeagent.com). Freelancers create detailed resumes or "E*portfolios," which employers can browse. There are pros and cons to the way this site handles contact information. You can post just about every type of contact information—telephone, cellular, fax, instant-messaging ID, and e-mail. But you either share that information with no one or everyone. There's no filtering mechanism at all. Employers can also post jobs, though we didn't see many. Like **Monster Talent Market**, this is a work in progress.

Marketing Yourself

➤ Of course, posting a resume on a Web site is just step one. You'll also want to network with other professionals who can advise you and with prospective clients who can hire you. Now in preview status, **Guru.com** (www.guru.com) provides freelancers with a bit of Web-based community. There's a handy Q&A column full of marketing tips, and excellent guides address important issues such as who owns the copyright for your work. A "gig matching engine," which will pair freelancers and clients, is in the works, but we like this site already.

You can also find networking opportunities and career tips at Web sites devoted to your particular area of expertise. Writers

and listings of events. Many groups, however, are local in nature—such as the **New York New Media Association** (www.nynma.org), for Silicon Alley-based Web designers and content producers, and the **North Bay Multimedia Association** (www.nbma.com), for their San Francisco-based counterparts.

Tackling the Nitty Gritty

➤ Once you're out on your own, you'll have to pay for your own insurance and remember to set money aside for taxes, as it will no longer be deducted from your pay. To get the scoop on insurance—from life to disability to health—check out **insure.com** (www.insure.com), a terrific site that does the impossible: It explains insurance issues in a language comprehensible to mere mortals. Helpful FAQs offer tips for buying health insurance and a checklist assures that you'll ask all the right questions. If you haven't yet taken the freelance plunge, be sure to see **insure.com's** overview of COBRA rights.

For tax matters, one place to visit is the place everyone else tries to avoid: the **Internal Revenue Service** (www.irs.gov). This site is loaded with helpful information, such as when you can take deductions for using your home as an office.

Tools of the Trade

➤ Finally, if you're using your home as a base of operations, you'll want to equip it. **Staples** (www.staples.com) offers free delivery for orders over \$50. Stop by **Download.com** (www.download.com) and pick up a copy of **Blue Box Invoices**, which generates bills for time and expenses. Then head over to **ZDNet** (www.zdnet.com) for a free trial version of **Pagoo**, which displays incoming phone messages while you are online. And finally, visit the **Canadian Springs** (www.canadiansprings.com) site to find all the details about renting the one item that completes your office setting: the water cooler. **PC**



and editors, for example, will want to bookmark the **Freelance Editorial Association's** site (www.tiac.net/users/freelanc), where they will find job boards, suggested fee schedules,

Career megasite **Monster.com** offers freelancers the world's first online talent auction. Post your qualifications, set your desired rate and let the bidding begin.

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The BIG GUYS sales process.



PRE-SALE

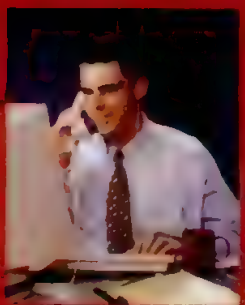


SALE



POST-SALE

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PRE-SALE



SALE



POST-SALE

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SAMPLE WORKSTATIONS

SIN DUAL PIII 733MHz

- (1) Intel PIII 733MHz Processor
- 256MB Cache 133MHz Bus
- Upgradeable to 2 CPUs
- 256MB SDRAM Expandable to 4GB
- Slots: (2) 64bit PCI, (3) 32bit PCI, (1) AGP Pro
- NEW! IBM 9GB 10,000RPM Ultra 3 - 60
- Adaptec Ultra 3/160 Controller
- Intel Ethernet 10/100 + Sound
- Oxygen GYX 32MB Video
- Sony DVD CD-ROM
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

3772

SIN DUAL PIII 667MHz

- (1) Intel PIII 667MHz Processor
- 256MB Cache 133MHz Bus
- Upgradeable to 2 CPUs
- 128MB SDRAM Expandable to 4GB
- Slots: (2) 64bit PCI, (3) 32bit PCI, (1) AGP Pro
- Matrix 6400 Max 32MB 4x AGP Video
- Dual Monitor Supports
- Intel Ethernet 10/100 + Sound
- IBM 34GB 7200RPM Ultra 66 Drive
- Sony 40x CD-ROM/Max
- Keyboard, Floppy, Mouse
- Mid Tower

2126

SIN DUAL PIII 450MHz

- (1) Intel PIII 450MHz Processor
- 512KB Cache, Expandable to 2 CPUs
- 128MB SDRAM Expandable to 2GB
- Slots: (6) PCI, (1) ISA, (1) AGP
- Matrox 6400 Max 16MB 4x AGP Video
- Dual Monitor Support
- IBM 13.5GB 7200RPM DMA 66
- Sony 40x CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt

1197

SIN DUAL PIII 400MHz

- (1) Intel Pentium III 400MHz Processor
- 512KB Cache, Upgrade to 2 CPUs
- 128MB SDRAM
- Slots: (5) PCI, (2) ISA, (1) AGP 8x chipset
- Q: (3) IBM 9GB 10,000 RPM LVD SCSI HD
- (1) Channel RAID 0: 5
- Sony DVD CD-ROM
- Soundblaster Live
- Subwoofer Speakers
- Diamond V770 Ultra 32MB AGP
- Sony CD Recorder Rewritable
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

3517

SIN Celeron 400

- Celeron 400MHz
- 64MB SDRAM
- Slots: (3) PCI, (3) ISA (1 shared), (1) AGP, 8x Chipset
- Integrated Creative Labs Sound
- 4 MB AGP Video
- 10/100 Ethernet
- 8GB IDE Hard Drive
- 17 Watt Surround Speakers
- 40x CD-ROM
- Keyboard, Floppy, Mouse
- Mid Tower Chassis

680

SAMPLE SERVERS



TECH RAID SERVER

- (1) Intel Xeon PIII 550MHz Processor
- 512MB Cache - Expandable to 4 CPUs
- 256MB ECC Memory Expand to 4GB
- Slots: (7) PCI, (1) ISA • Integrated 2MB Video
- Integrated Dual Ultra 2 LVD SCSI Controllers
- 4 Chan. Ultra 2 64 Bit RAID w/64MB Cache
- NEW! 31GB 36GB 10,000RPM LVD HD
- Intel Server Adaptor
- Server Management System On-board
- 40x CDROM/Max • Keyboard, Floppy
- 9 Drive Bay Q, (6) 230 Watt Redundant Power Supplies

11,100

Rackmount Solutions Available in 4U & 9U

2U RACKMOUNT PIII 700MHz

- (1) Intel Pentium III 700MHz Processor
- 512KB Cache, Expandable to 2 CPUs
- 128MB ECC Memory Expandable to 1GB
- Slots: (4) 33MHz PCI, (2) 66MHz PCI GX Chipset
- Integrated Adaptec Ultra2 LVD SCSI
- Integrated 10/100 Ethernet
- Integrated 2MB Video
- 9GB LVD 7200RPM HD
- 40x CDROM/Max, Keyboard, Floppy
- 2U Rackmount 300 Watt Power Supply

2899

Tower Solutions Available

3U DUAL PIII 600MHz

- (1) Intel 733MHz Processor
- 256MB Cache 133MHz Bus
- Upgradeable to 2 CPUs
- 256MB ECC SDRAM Upgradeable to 4GB
- Slots: (2) 64bit PCI, (3) 32bit PCI, (1) AGP Pro
- 16 MB Video
- 4 Channel Ultra 2 64Bit RAID
- Q: (3) IBM 9GB LVD 10,000RPM Remov. HD
- 40x CDROM, Max: Keyboard, Floppy
- Intel 10/100 Ethernet
- 13 Bay Tower 400 Watt Redundant Hot Swap Power

6377

13 Bay Rackmount Solution Available

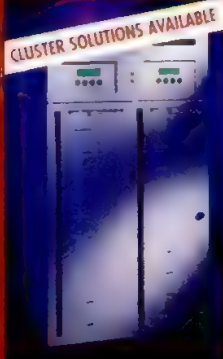
3U DUAL PIII 450

- (1) Intel Pentium III 450MHz Processor
- 512KB Cache, Expandable to 2 CPUs
- 128MB ECC Memory Expandable to 1GB
- Slots: (4) 33MHz PCI, (2) 66MHz PCI GX Chipset
- Integrated Adaptec Ultra2 LVD SCSI
- Integrated 10/100 Ethernet
- Integrated 2MB Video
- 9GB LVD 7200RPM Remov. HD
- Sony 40x CD-ROM/Max
- Keyboard, Floppy, Mouse
- Full Tower 300 Watt
- Intel Server Control Manager Software

1550



SAMPLE RAID SUBSYSTEMS



CLUSTER SOLUTIONS AVAILABLE

STC 10 BAY

- 2 Channel RAID LVD U2W Controller
- 10 Hot Swappable Drive Bays
- Redundant Power Supplies
- 16MB Cache
- Internal Temperature Status
- Power Supply Status
- Cooling Fan Status
- Visual and Audible Alarm

Q: (3) 36GB 10,000RPM LVD HD	10,200
Q: (3) 18GB 10,000RPM 15 Ohm LVD HD	7928
Q: (3) 9GB 10,000RPM 15 Ohm LVD HD	6458

STC 20 BAY

- Active/Active Controllers
- Q: (2) 4 Channel RAID 5 U2W Controllers
- 8 - 230 Watt Hot Redundant Power Supplies
- 128MB of Cache
- Internal Temperature Status
- Power Supply Status
- Cooling Fan Status
- Visual and Audible Alarm

72GB Solution	
Q: (8) 9 1GB 7200RPM LVD HD	17,813
72GB Solution	
Q: (8) 9GB 10,000RPM 15 Ohm LVD HD	18,800
144GB Solution	
Q: (8) 8GB 10,000RPM LVD HD	22,800



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- Removable Drives
- Redundant Power Supplies
- 3RHS-0710W
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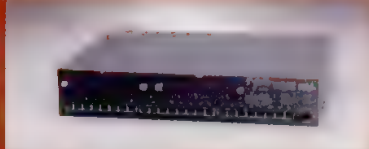
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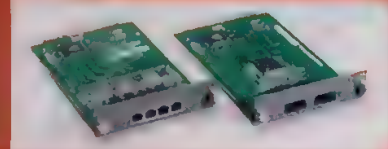
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The Pentium III Goes Mobile

Intel finally brings its flagship CPU to the mobile platform, enhanced by a better cache design and 100-MHz bus support.

By Carol Venezia

So Intel has finally decided to bring the Pentium III processor to the notebook platform. Big deal, you say? Well, actually it is. Why? Because unlike the decidedly ho-hum first-generation desktop Pentium III processor (known as Katmai) announced earlier this year, the Mobile Pentium III chip is about more than just megahertz. And that's what makes it so exciting.

On paper, the Mobile Pentium III part—available at speeds of 400, 450, and 500 MHz—looks a lot like existing Mobile PII/400 CPUs. Both are manufactured on a 0.18-micron process; have 256K of full-speed, on-die Level 2 cache; and both have low

core voltages (1.6v for the 450- and 500-MHz PIIIs; 1.35v for the PIII/400 spin). But the Mobile Pentium III goes a bit further in two key areas—L2 cache design and front-side bus speed—and it has Streaming SIMD Extensions as well.

Speeds and Feeds

The Mobile PIII is actually the exact same processor as the newer desktop PIII, which you can find at speeds up to 733 MHz. Both are known by the code name of Coppermine. (For more information on Coppermine, see this issue's cover story.) For the mobile spin, Intel just turned on various power management features that are needed in notebooks.

One feature that didn't change from desktop to mobile version is Coppermine's L2 cache design, called the Advanced

Transfer Cache. This cache design offers greater bandwidth (32 bytes for every two clocks) and more than four times reduction in latency. Together these improvements help programs get data out of cache more quickly and reduce the performance penalty exacted by L1 cache misses (when the data can't be found in L1 cache).

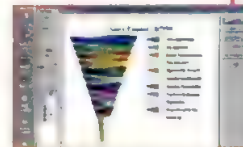
These Pentium III notebooks are also the first Intel-based mobile systems to use a 100-MHz bus (some vendors—notably Compaq—have been shipping AMD K6-2-based notebooks with 100-MHz buses for months). The chip set—Intel's 440BX—is the same as existing Pentium II notebooks, but the 100-MHz bus capability has finally been turned on. You'll find that each machine here utilizes 100-MHz SDRAM rather than standard 66-MHz of memory.

So how does all of this new material translate in terms of performance? After all, if you're paying well north of \$3,000 for a PIII notebook, you're most likely interested in speed. Our testing showed that the average PIII/500 notebook here performed 15 percent better on our ZD Business Winstone 99 test than the average PII/400 notebook from our August roundup.

These systems also excelled on our new ZD Content Creation Winstone 2000 test. This test uses Adobe Photoshop and Premiere, Macromedia Director and Dreamweaver, and other apps to show how a machine will

THE NEXT ACT:

Symantec's ACT! 2000 adds plenty of new features while maintaining its ease of use. *Page 49.*



APPLE OF MY I:

The Apple iBook sure looks like a winner, but how does it perform? *Page 53.*



FREE PARKING:

Four new Web services let you store your files on their servers. *Page 60.*



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Epson Perfection 1200U.....	64
Microsoft Works Suite 2000.....	66
AOL 5.0.....	66
Easy CD Creator 4 Deluxe.....	68
HP CD-Writer Music.....	68
Delphi 5 Enterprise.....	73
LapLink 2000.....	73

More Reviews Online

- OmniViewer
- HotMetal PRO 6.0
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FIRST LOOKS

perform when producing content for the Web. For the most part (excluding the IBM ThinkPad 600X 5EU, which posted a relatively low score), these units performed on par with the average PIII/500 desktop from this issue's cover story.

Tested battery life for all four notebooks was also impressive. On the average, they lasted nearly half an hour longer on our BatteryMark 3.0 test than comparably equipped Pentium II/400 notebooks tested in our August roundup.

The Players

For our inaugural look at the Mobile Pentium III, we asked vendors to send us desktop replacement machines. Below you'll see reviews of systems

both for individuals and small-business buyers (the Dell Inspiron 7500 R500VT and the Gateway Solo 9300) as well as for corporate buyers (the HP OmniBook 4150 and the IBM ThinkPad 600X 5EU). All have 128MB of 100-MHz SDRAM and Windows 98 in common. And all, save the Gateway unit with a 450-MHz part, run on the PIII/500.

Another new element found in three of the four notebooks here (all except the ThinkPad) is ATI's Rage Mobility-P AGP graphics chip set with 8MB of memory. This chip set is the first to support desktop-like functionality on a mobile platform, with such features as dual-display capability; integrated motion compensation hardware

DVD decode assist (which lowers CPU utilization and therefore consumes less power); and ATI's TriView architecture, which enables simultaneous display to the notebook's LCD panel, an external monitor, and an external TV.

Not everyone was as quick out of the gate with final Pentium III notebook configurations, but all major vendors should offer them by the time you read this. Examples include the Compaq Armada E700 (\$4,699 direct) with a PIII/500 and a 15-inch display (www.compaq.com) and the Toshiba Tecra 8000 (\$4,178 direct) with a PIII/500 and a 14.1-inch display (www.toshiba.com).

Whether you're a corporate buyer looking for a manageable

notebook or an individual looking for lots of bang for your buck, there's likely a notebook here to fit your needs.

Dell Inspiron 7500 R500VT



Toting this notebook around may require some muscle, but if you need a real desktop replacement machine, there's currently none better than the Dell Inspiron 7500 R500VT (\$4,101 direct). This 10.3-pound (travel weight) system seamlessly combines leading-edge components with awesome performance, grabbing the top spot on every benchmark test we ran, as well as our Editors' Choice for personal and small-business users.

The focal point of the Inspiron is its 15-inch-diagonal screen. This size is certainly nothing new, but the panel's native resolution of 1,400-by-1,050 (which Dell calls SXGA+) is well worth talking about. This panel has 87 percent more pixels than a 15-inch, 1,024-by-768 display, which let us show about 50 percent more spreadsheet data than on other systems with 15-inch screens.

Another feature of the Inspiron that adds to its appeal as a mobile desktop is its two options bays, both located up front. First is the MegaBay, which can hold a lithium battery, a Zip Drive (included in the above pricing), or a second hard disk. Next door is the Media Bay, which had a combo DVD/floppy disk drive in our test unit and can also accommodate a third hard disk, a second battery, or a CD-RW drive, among other options.

Our test machine had 128MB SDRAM (expandable to 512MB) and a 25GB hard disk. The Inspiron will hold up to 75GB total storage, if you install a second 25GB disk in the MegaBay, and a third in the Media Bay (obviously, in this configuration, you'll have to run

BENCHMARK TESTS

Pentium III Notebooks



Across the board, the Dell Inspiron 7500 R500VT notched the top scores on all our benchmark tests, including the new ZD Content Creation Winstone 2000. It really stood out in a couple of areas, most notably ZD Business Disk WinMark 99 where it scored 25 percent better than the next closest competitor, the HP OmniBook 4150. It also posted an excellent BatteryMark result.

In general, the Mobile Pentium III delivers a significant performance boost over Intel's previous flagship mobile processor, the 400-MHz Pentium II. For example, it yielded a 15 percent better score on ZD Business Winstone 99. Amazingly, you get all this added performance and the best battery life here.

This story was a great opportunity to roll out our new ZD Content Creation Winstone 2000 suite, which measures performance of Windows 98 or NT systems when running popular Internet content-creation applica-

tions such as HTML editors, multimedia authoring programs, and audio- and video-editing applications. The test is specifically designed to stress the graphics and disk subsystems. For more information on Content Creation, turn to our cover story in this issue.

Because Content Creation is a new test program, there are no results for Pentium II/400 notebooks, but the reference system (a desktop PC with a 233-MHz Pentium MMX processor and 64MB of SDRAM) received a score of 10.0. Once again, the Inspiron 7500 came out on top with a score that was 110 percent better than the reference system's.

Despite its strong Graphics WinMark score, the IBM ThinkPad lagged on Content Creation, most likely because of bottlenecks in its disk and graphics subsystems.

If you are looking for desktop performance in a notebook PC, the Pentium III pushes portable computing to a whole new level.—*Analysis written by Laura Cox*

High scores are best.						
Bold type denotes first place.						
■ denotes Editors' Choice.						
	ZD Business Winstone 99	ZD Content Creation Winstone 2000	ZD Battery- Mark 3.0 Hours: minutes	ZD Business Graphics WinMark 99	ZD Business Disk WinMark 99 Thousands of bytes/sec	ZD 3D WinMark 99
Gateway Solo 9300 (PIII/450)	22.1	19.5	4:03	155	2,260	196
HP OmniBook 4150 (PIII/500)	23.6	20.5	3:22	157	2,627	181
IBM ThinkPad 600X 5EU (PIII/500)	23.5	13.5	3:35	163	2,170	N/A ¹
Average	23.3	18.6	3:48	159	2,588	N/A ¹
Average Mobile Pentium II/400*	20.2	N/A ²	3:26	117	2,077	N/A ²

* From "Portable PCs," August 1999.

N/A¹—Not applicable. The IBM system could not complete this test.

N/A²—Not applicable. We did not run this test for that roundup.

Editors' Choice

- Personal: Dell Inspiron 7500 R500VT
- Corporate: HP OmniBook 4150



The Dell Inspiron 7500 R500VT sets new standards for performance and is packed with features that will appeal to individuals and small businesses alike. The HP OmniBook 4150, by contrast, is all business. But both units are excellent choices for desktop replacement notebooks.

More is more when it comes to the Inspiron. Although the unit is surely one of the biggest, heaviest notebooks out there, what sets the system apart is unparalleled performance on all benchmark tests; a brilliant 15-inch, 1,400-by-1,050 display; and a four-spindle design.

For corporate buyers, the HP OmniBook 4150 is our top pick. The OmniBook has all the leading-edge components and delivered solid performance. But the OmniBook's chief asset is its management features.

on AC power). You can also set up the notebook in a four-spindle configuration with the primary hard disk installed, plus a combo drive in the Media Bay, and a Zip Drive or hard disk in the MegaBay.

The one gripe we have with this notebook is that you can't swap out drive modules without shutting the unit down. This is a major drawback for a system that goes to great lengths to give you desktop-like functionality. But if what you want is the biggest,

burliest desktop-to-go, the Dell Inspiron 7500 R500VT is it.

Gateway Solo 9300

Site developers and content creators on the go and on a budget should take a close look at the Gateway Solo 9300. At \$3,199 (direct), this notebook is the lowest priced unit here—although granted, it's also not as aggressively configured. But the system did perform well in general (considering it was the only

Dell Inspiron 7500 R500VT

Direct price: \$4,101 with PIII/500 CPU, 15-inch SXGA+ display, 25GB hard disk, 6X DVD-ROM drive.

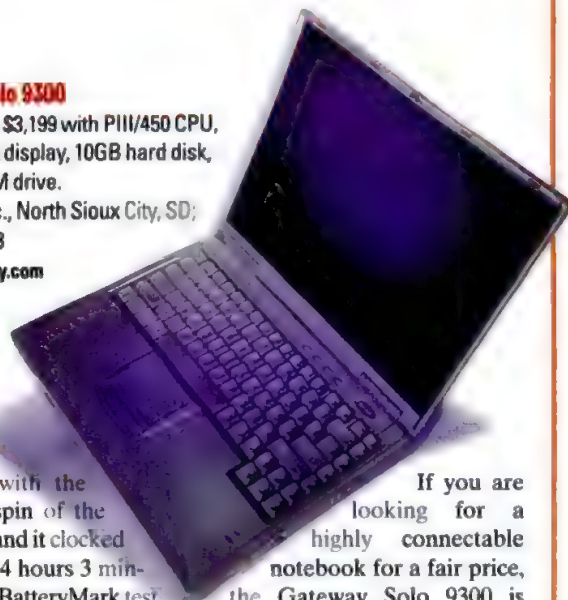
Dell Computer Corp., Round Rock, TX; 800-388-8542
www.dell.com



Gateway Solo 9300

Direct price: \$3,199 with PIII/450 CPU, 15-inch XGA display, 10GB hard disk, 4X DVD-ROM drive.

Gateway Inc., North Sioux City, SD; 800-846-4208
www.gateway.com



one here with the 450-MHz spin of the PIII chip), and it clocked a fabulous 4 hours 3 minutes on our BatteryMark test.

The Solo incorporates some connectors rarely seen on mobile machines. On the left side there's a four-pin, nonpowered, high-performance serial bus port, so you can plug in a DV camcorder and edit video. You'll have to supply your own video-editing software, however, because Gateway doesn't bundle any. On the back of the machine, you'll find jacks for composite video-in and -out, as well as an S/PDIF-out port for hooking up devices that support digital audio.

Another appealing aspect of the Solo is its size. With a 15-inch XGA display, it's half an inch thinner and 1.5 pounds lighter than the Inspiron when equipped for the road. But as we mentioned previously, our test unit was lacking a bit, comparatively speaking, in hardware—it's the lone PIII/450 here—and its hard disk is the smallest, at 10GB. But you can order a Solo with a 500-MHz CPU and an 18GB hard disk (\$3,699 direct) if you choose.

Quick-launch and shortcut buttons abound on the Solo, from front-mounted DVD/CD-player controls to multifunction buttons above the keyboard to launch applications. No player auto-launches after you insert a CD or DVD, as happens on other systems, forcing you to pick through the Start menu to launch the right app manually.

If you are looking for a highly connectable notebook for a fair price, the Gateway Solo 9300 is worth considering.

HP OmniBook 4150

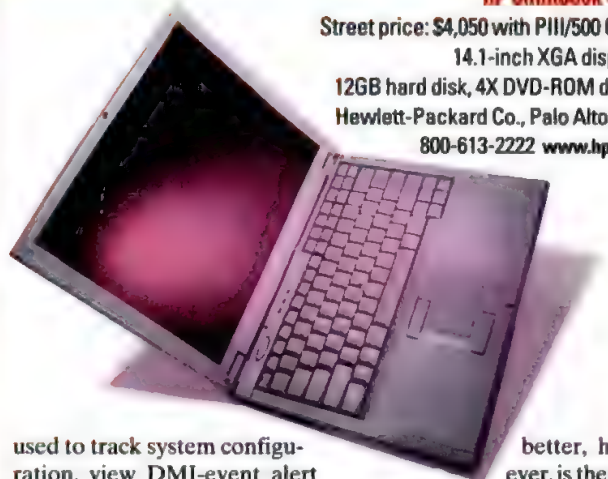


Many vendors sell manageable desktop PCs, but Hewlett-Packard is one of the few that fully equips its notebooks with the proper tools to manage them as corporate assets, whether they're on the road or docked on a desk. Even more impressive is the fact that HP delivers this top-flight manageability solution on a leading-edge platform—you won't find yesterday's technology wedged into the HP OmniBook 4150 (\$4,150 street). This machine—our Editors' Choice for corporate buyers—scores on all counts.

TopTools is HP's Web-based management package for dynamically tracking devices on your network; Version 4.5 for Notebooks ships on all OmniBooks. The package is specifically designed for OmniBooks, as opposed to a desktop management package slapped onto a notebook. TopTools for Notebooks not only supports all attributes of the DMI 2.0 specification, it also implements over 300 additional elements that are specific to HP notebooks.

TopTools is browser-based, easy to use, and presents a single, clean interface that can be

FIRST LOOKS



HP OmniBook 4150

Street price: \$4,050 with PIII/500 CPU,
14.1-inch XGA display,
12GB hard disk, 4X DVD-ROM drive.
Hewlett-Packard Co., Palo Alto, CA;
800-613-2222 www.hp.com

used to track system configuration, view DMI-event alert logs, and even update the notebook's BIOS over the LAN. HP also preloads its DiagTools for OmniBook PCs, a simple-to-run program that will diagnose what ails your notebook, and can generate a support-ticket log file.

We were equally jazzed by the OmniBook's hardware components and performance. With its PIII/500 CPU, 12GB hard disk, and 8MB ATI Rage Mobility-P graphics engine, this system ran a close second to the top-scoring Dell unit on most of our benchmark tests. Its BatteryMark score of 3 hours 22 minutes trailed the pack but was impressive nonetheless when you consider the OmniBook's 14.1-inch XGA display. Even

better, however, is the fact that if you're already an HP OmniBook 4150 customer, you won't have to change your company's software image to accommodate this new machine.

With more and more corporations mobilizing their workforces, manageability is becoming a key issue that notebook vendors must address. And if any vendor is ahead of the game, Hewlett-Packard is the one.

IBM ThinkPad 600X 5EU

Taking your power-packed show on the road doesn't have to mean lugging 10 pounds worth of portable around—and no machine here proves that point better than the IBM

ThinkPad 600X 5EU (\$4,310 street). This manageable, two-spindle notebook weighs a svelte 6.2 pounds ready to travel—nearly 1.5 pounds lighter than the OmniBook. On the downside, this ThinkPad may not be suitable for all users, as it lagged the pack by a significant margin on our ZD Content Creation Winstone 2000 test.

Starting with the IBM ThinkPad 600X 5EU, the company plans to replace its existing Universal Management Agent with a new management suite called UMS (Universal Management Services), which lets you view, monitor, and control networked PCs. According to IBM, UMS will support the latest management standards, so the suite will integrate with a wide range of enterprise management applications. You can also remotely set up ThinkPads (including auto-

matic OS image push) via IBM's LANClient Control Manager, a free download for IBM customers. The only downside is that this approach may not be as appealing as HP TopTools' one-stop-shopping experience. Also, due to a change in graphics chip set, you can't use your existing ThinkPad 600 software image on the 600X unit.

Thankfully, this machine's light weight doesn't mean light features. The unit retains the 13.3-inch display found on existing ThinkPad 600s but adds a 12GB hard disk, a 6X DVD-



IBM ThinkPad 600X 5EU

Street price: \$4,310
with PIII/500 CPU,
13.3-inch
XGA display,
12GB hard disk,
6X DVD-ROM drive.
IBM Corp., Armonk, NY;
800-426-7255 ext. 4751
www.ibm.com/pc/us/thinkpad

ROM drive, and a new NeoMagic graphics controller with 4MB of memory (the previous generation had 2.5MB of memory). The system performed well on 2-D benchmarks, and managed a capable 3 hours 35 minutes on our BatteryMark test.

But the ThinkPad was unable to run our 3D WinMark test (its graphics chip set doesn't support hardware-accelerated 3-D), and its Content Creation Winstone score was 33 percent lower than the average of the other three notebooks in this roundup.

Minor performance issues aside, the IBM ThinkPad 600X 5EU is a manageable and flexible notebook solution. In addition, IBM is the only vendor in this roundup to earn a grade of A for notebooks on our most recent survey of Service & Reliability. **PC**

SUMMARY OF FEATURES

Pentium III Notebooks

	PC MAGAZINE EDITORS' CHOICE Dell Inspiron 7500	PC MAGAZINE EDITORS' CHOICE Gateway Solo 9300	PC MAGAZINE EDITORS' CHOICE HP OmniBook 4150	IBM ThinkPad 600X 5EU
Price (with 128MB of RAM)	\$4,101 direct	\$3,199 direct	\$4,050 street	\$4,310 street
System weight/Travel weight (pounds)	9.3 / 10.3	7.8 / 8.7	6.7 / 7.6	5.5 / 6.2
Dimensions (HWD, in inches)	2.3 x 12.8 x 10.5	1.8 x 12.5 x 10.3	1.5 x 12.5 x 10.0	1.5 x 11.8 x 9.5
Processor	Pentium III/500	Pentium III/450	Pentium III/500	Pentium III/500
LCD-panel size (inches)/Native resolution	15.0 / 1,400 x 1,050	15.0 / 1,024 x 768	14.1 / 1,024 x 768	13.3 / 1,024 x 768
Graphics chip set	ATI Rage Mobility-P AGP	ATI Rage Mobility-P AGP	ATI Rage Mobility-P AGP	NeoMagic MagicGraph 256ZX
Graphics memory	8MB SGRAM	8MB SGRAM	8MB SGRAM	4MB SGRAM
Hard disk capacity	25GB	10GB	12GB	12GB
DVD-ROM speed	6X	4X	4X	6X
Standard warranty on parts/labor	3 years/3 years	1 year/1 year	3 years/3 years	3 years/3 years
Service and Reliability grade*	B	B	C	A

* PC Magazine, July 1999

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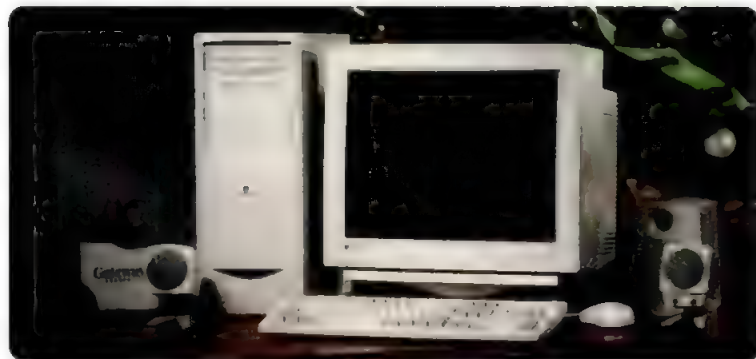
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VX900 .26 Screen Pitch 19" Monitor
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Build Web Databases

FileMaker Pro 5 is the simplest way to build databases and put them on the Web.

By Timothy Dyck

Turning a tough task into a simple one has long been the forte of the folks at FileMaker. The latest version, FileMaker Pro 5 (\$249 list), lives up to that reputation, providing the easiest solution for putting a database on the Web.

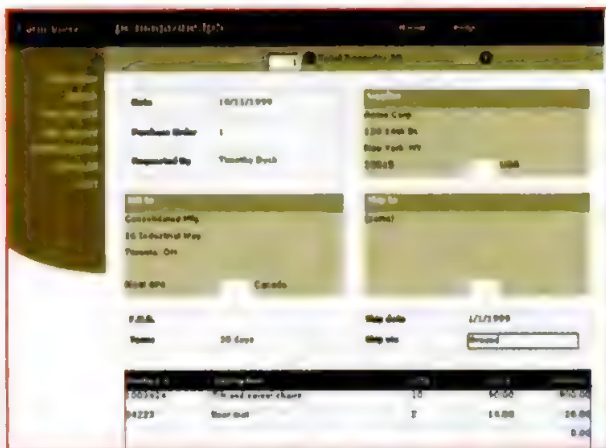
Web publishing features aren't new in desktop database products, but FileMaker makes them easier to use than anyone else. After loading a normal FileMaker database, we had only to single-click to activate its Web publishing option. Then we typed our own machine's host name into a browser, and FileMaker generated a complete Web-based interface.

Using the Web interface, we could view and search for records in our database, as well as edit or create new records. FileMaker's Web interface is li-

censed for access by only ten separate IP addresses over a 12-hour period.

New with this release, FileMaker uses Cascading Style Sheet 2 (CSS2) absolute positioning commands to create a Web interface that closely matches its own native forms layout. This means we could use FileMaker's intuitive native forms editing tools to design our Web interface without knowing a stitch of HTML. The downside is that only Microsoft Internet Explorer 4 or later currently supports the CSS2 absolute positioning tags.

Another downside to FileMaker's Web features is that they interfered with local use of the same database. They constantly changed which record we saw locally to match the current record of our remote Web users—despite the fact we were in the middle of editing the local record.



SPITTING IMAGE: FileMaker generates great-looking Web interfaces, as long as you use IE 4 or later.

FileMaker offers new support for Open Database Connectivity (ODBC), a standard way applications access databases. This feature makes FileMaker data much more useful, because we could access our FileMaker data from other programs for the first time. For example, using FileMaker's new ODBC driver, we did a mail merge in Microsoft Word.

FileMaker Pro 5 supports bidirectional connections from other programs over ODBC, but its outgoing ODBC support is limited to data import only.

Despite its few limitations, publishing a database to the Web doesn't get any easier than with FileMaker Pro 5.

FileMaker Pro 5. List price: \$249; upgrade: \$149. Requires: 16MB RAM; Microsoft Windows 95, 98, or Windows NT. FileMaker Inc., Santa Clara, CA; 800-325-2747; www.filemaker.com.

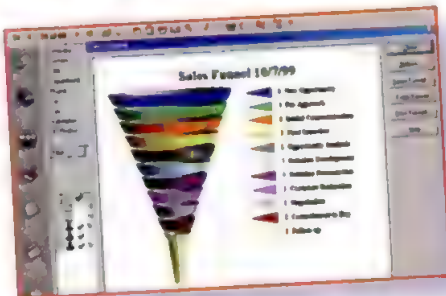
A Class ACT!

Symantec polishes up its sales skills in the latest version of its popular contact manager.

By Greg Alwang

The granddaddy of contact managers, Symantec's ACT! has gotten a face-lift—with new sales opportunity tracking, better Web integration, and expert sales tips. Ideal for small sales forces and SOHO users, ACT! 2000 (\$199.95 list) also adds many high-end features such as sales forecasting, multitier account management, extensive customization, and tight Microsoft Outlook integration. Despite these powerful features, ACT! 2000 manages to keep things simple.

Like GoldMine, ACT! 2000 adopts the approach of providing sales coaching in addition to contact management. Using Dale Carnegie's Sales Ad-



STEP-BY-STEP: The new Sales Funnel graph provides a snapshot of the points of opportunities in the 11 sales stages.

vantage Training techniques, ACT! 2000 tracks opportunities throughout the stages of the sales process. The new Sales Funnel shows a snapshot of contacts in each stage.

To help find information, ACT! 2000 lets you look up any

field, not just default-indexed fields. The enhanced keyword search lets you find words anywhere, or you can limit your

search to specific field categories. The Microsoft Outlook-like icon bar lets you easily switch between different contact views. For more organized account management, you can now create groups and subgroups of contacts and define rules to group new contacts.

Internet resource links introduced in the last version have been extended to include more relevant content, such as myprospects.com, a sales lead generation site, and Hot Data, a service that updates area codes.

Outlook appointments can show up in ACT! 2000! and vice versa—no more duplication of

calendars. You can also create an Activity Series, which includes multiple tasks that you repeat frequently, such as mailing letters and following up with calls a week later. All the tasks in the Series are scheduled or rescheduled in one step.

With this version, Symantec has keyed in on mobile sales professionals. The bundled Paragon FoneSync option lets you download your ACT! 2000! contacts to your digital cell phone. You can also synchronize contacts with Palm Pilot devices.

As Symantec continues to pile on features, ACT! 2000 is growing from a contact manager into a powerful, flexible tool for sales forces.

ACT! 2000. List price: \$199.95. Requires: 16MB RAM; 50MB hard disk space; Microsoft Windows 95, 98 or NT 4.0. Symantec Corp., Cupertino, CA; 408-253-9600; www.symantec.com.



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iBook Report

The Apple iBook has drawn lots of attention, but how does it stack up? We put it to the test.

By Jon Hill

You've seen the pictures: a glowing translucent notebook with orange or blue highlights standing on its ear, side profile. Your kids want one before they even know what it is. The Apple iBook is a looker, that's for sure. But can it live up to the hype?

That side-view photo, for instance, neatly hides the fact that the iBook is big. At 2.0 by 13.5 by 11.6 inches (HWD), this is one of the largest notebooks we've seen. The iBook's 12.1-inch, active TFT screen and full-size keyboard are surrounded by acres of real estate. At 6.6 pounds, (not counting the hefty AC adapter) the iBook is not exactly an ultraportable.

Then there's the performance numbers—Apple claims that its iBook is “up to twice as fast as comparable Microsoft Windows-based portables.” Our own cross-platform testing does not support that claim. On the contrary, our tests show that for common Internet-related tasks, an IBM ThinkPad iSeries 1480 provides significantly better performance. To be fair, the ThinkPad iSeries came with a faster processor (a 466-MHz Celeron) than the iBook's PowerPC G3/300.



But both were equipped with 64MB of RAM (we added a 32MB memory module, available online for anywhere from \$74 to \$132, to the iBook). And both are designed for the same consumer and small-business users.

Nonetheless, the iBook offers a number of interesting features. Apple says the battery will last an outstanding 6 hours, and in informal testing (ZD BatteryMark doesn't run on Macs), we found nothing to refute that claim. With a built-in V.90 modem and 10/100Base-T Ethernet port, getting connected is easy.

With the optional Apple AirPort Card, you can share files, printers, and even Internet access at speeds of up to 11 Mbps. The AirPort Card meets the

802.11 wireless networking specification, so it should work with any other PC (Mac or Microsoft Windows) with standards-based wireless networking. Unfortunately, the AirPort was not ready in time for this review. Perhaps the most impressive aspect of AirPort is its price: The AirPort Card costs \$99 (list), and the Base Station costs \$299 (list).

TAKING ITS OWN ROAD: The Apple iBook doesn't look like your average notebook PC.

Apple also gets some of the basics right: The keyboard is comfortable, and the trackpad works reasonably well. The rounded latchless design is unusually rugged, clearly designed for a life crammed into an overloaded backpack.

The ample software bundle includes AppleWorks, a serviceable suite of office applications; Microsoft Internet Explorer and Netscape Communicator; EdView Internet Safety Kit, for keeping your preteen away

from questionable Internet sites; Palm Desktop; and the WorldBook Encyclopedia.

The iBook is missing a number of features, however, that savvy PC consumers have come to expect. There is no PC Card slot, no floppy disk drive, no serial or parallel ports, and just a single-channel USB port. Unlike Apple's other current offerings, the iBook doesn't have a FireWire port.

The iBook's ATI Rage Mobility graphics controller is among the top current 2-D and 3-D notebook chips, but you can't hook the iBook up to an external monitor. Audio quality is among the worst we've encountered—the single mono speaker is simply awful.

If you want the most performance and features (especially I/O options) for your dollar, you'll be better off with a Windows-based notebook PC. But for some people, none of these shortcomings will matter. And perhaps that's okay because behind all the hype, the iBook nevertheless delivers reasonable performance, rugged good looks, and lots of networking options. All of which make the Apple iBook a good choice for its primary audience of students and home users.

Apple iBook. Base price: With 32MB RAM, \$1,599. Apple Computer Inc., Cupertino, CA; 800-692-7753; www.apple.com.

BENCHMARK TESTS

Apple iBook

To compare the iBook with consumer notebook PCs running Windows, we used the new benchmark test suite i-Bench, developed by ZD Labs. Because this program is browser-based, i-Bench can be run on any device or OS that has a browser capable of displaying standard HTML. For details, see our cover story.

The results were striking. With the exception of some Apple QuickTime tests, on typical Internet applications the iBook does not perform nearly as well as the

IBM ThinkPad iSeries 1480, a Windows-based notebook PC that is also designed for consumers. i-Bench was officially introduced at the ZD Labs Benchmark

Rollout Event in early November, and the test should be available online by the time you read this (www.i-bench.com). —Analysis written by Laura Cox

ZD i-BENCH

▲ High scores are best.
▼ Low scores are best.
Bold type denotes first place.

	Load Complex Pages seconds ▼	Load Text-Based Pages seconds ▼	Quick-Time Transition Effects Frames per second ▲	QuickTime 56K/ASD Percent of frames played ▲	Quick-Time LAN Percent of frames played ▲	Java Virtual Machine Score ▲
MICROSOFT INTERNET EXPLORER*						
iBook	280.7	135.1	257.4	100	61.3	23.872
IBM ThinkPad iSeries 1480	41.5	42.1	173.8	100	91.4	43.766
NETSCAPE NAVIGATOR 4.7						
iBook	111.5	147.4	160.1	100	56.6	N/A
IBM ThinkPad iSeries 1480	66.1	97.3	159.6	100	91.2	39.522

* We used the latest version available for each platform (IE 5 for Windows and IE 4.5 for Macintosh).

N/A—Not applicable. The Java VM in the Macintosh version of Navigator doesn't support one of the Java 1.1 classes required by i-Bench.

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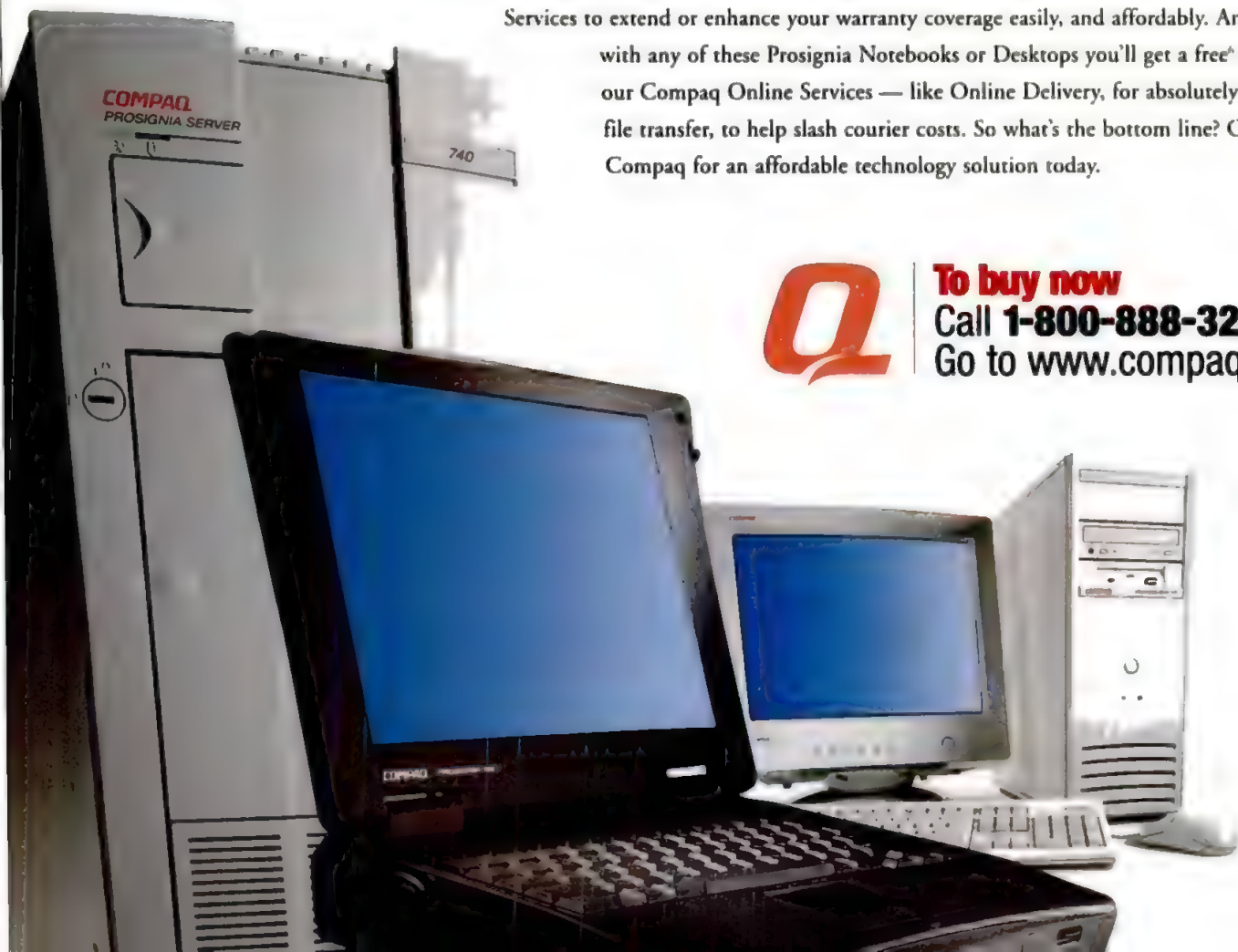
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- 3-Year Limited Warranty⁴

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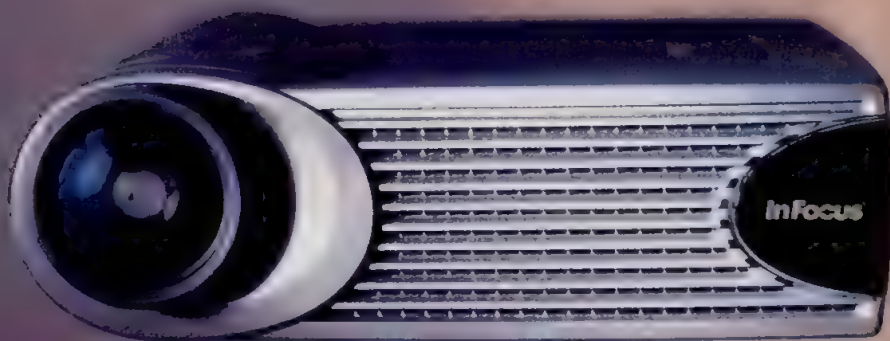
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Design of the Times

3D Studio MAX and 3D Studio VIZ are big players in the high-end animation game.

By John McCormick

Whether it's labeled Autodesk, Kinetix, or most recently Discreet, the 3D Studio product line is still the animation application of choice for 130,000 professionals. It's easy to see why when you look at the latest two 3D Studio releases and consider their features, expandability, and integration with other Autodesk products.

With productivity enhancements and an improved rendering engine, 3D Studio MAX R3 (\$3,495 list) is the core element of a high-end 3-D animation and rendering system compatible with everything from a \$95 mannequin library to a \$25,000 human motion capture suit. A limited version called 3D Studio VIZ R3 costs \$1,995 (list). We tested both.

3D Studio MAX R3

With 3D Studio MAX, you can import or build objects and backgrounds, then animate them by adding camera or light movement, gross object movement, movement of parts of an object, and even morphing, which can be used to create lip-sync movements. Animation can be as simple as clicking on the Animate button and altering a keyframe, but this hides immense power. For example, the new reactor controller lets you key events to the proximity of other objects—turning on a light when an object starts to move, for example.

Productivity improvements highlight this third major release. MAXScript records macros applied to nearly any feature, in-

cluding plug-ins, and the editable scripts can create new commands or functions placed in custom toolbars. External references let an artist edit animation or objects in core drawings, and the software makes corresponding changes in all related files.

3D Studio MAX features an entirely new renderer. Compared with Release 2.5, the results of rendering showed an im-

▶ IMPORTED FURNITURE: Use Asset Browser to drag and drop furniture into a 3D Studio VIZ design.

proved realism and greater flexibility. Key rendering tools such as shadows and anti-aliasing have been changed to plug-ins, which make the program easier to customize.

Experienced graphics designers can modify the options available in 3D Studio MAX, so that users see only the features they need. Training, however, can be a formidable task.

There are 11 toolbars for objects, shapes, compound shapes, lights and cameras, modeling, rendering, space warps, and so on—each of which has up to 30 basic tools. Clicking on one of these tools brings up different sets of controls along the right side of the work screen in each of the six major working envi-

ronments: create, modify, hierarchy, motion, display, and utilities. Each of these in turn offers as many as 20 controls, some of which have more than 30 subtools.

The gigantic number of tools can be baffling, but this rich toolset is where the power of 3D Studio MAX lies, and much of this power is hidden until you need it. The tutorials included with both 3D Studio MAX and VIZ aren't self-running or interactive demos. Instead, you follow text instructions in a window or in print. Print documentation

from CAD files. It's easiest to think of VIZ as an add-on to AutoCAD that can be linked to an AutoCAD design database (although AutoCAD isn't required to use 3D Studio VIZ). DWG Linking causes changes made in AutoCAD 2000 designs to be automatically reflected in VIZ.

Major 3D Studio MAX features left out of VIZ include advanced character animation and subobject animation—neither of which is important when you are creating a view of how a building will look as the sun moves across the sky. This isn't to minimize what VIZ does. Creating animated photo-realistic views of structures that don't exist is a highly complex task that VIZ makes look easy.

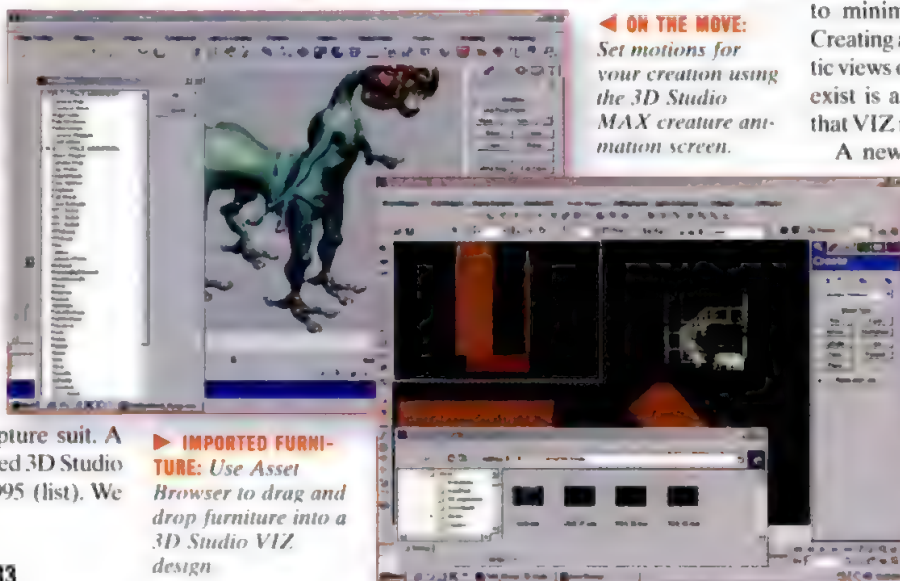
A new feature called Asset

Browser runs on top of Microsoft Internet Explorer 5.0, allowing VIZ users to drag and drop backgrounds, texture, and 3-D objects from Web pages as well as computers on a LAN. Under Microsoft Windows NT, you can run multiple sessions and perform network rendering, where a

single-license user of either 3D Studio MAX or VIZ can distribute frame-by-frame rendering tasks to as many as 10,000 other computers on a TCP/IP network.

When paired with AutoCAD, 3D Studio VIZ can help architects and mechanical engineers bring their designs to life.

3D Studio MAX R3. List price: \$3,495 (upgrade from MAX R2.x, \$795). **3D Studio VIZ R3.** List price: \$1,995 (upgrade from VIZ R2.x, \$595; upgrade from R1.x, \$895). Requires (both programs): Microsoft Windows 98 or NT, 128MB RAM, 300MB hard disk space, CD-ROM drive, parallel port (for hardware lock). Discreet, a division of Autodesk Inc., Montreal, Canada; 800-869-3504; www.ktx.com.





THE World Is Not Enough
007
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Expanding Possibilities

Storage Space on the Web

These four online services all offer free space, but each has its pros and cons.

By Alan Cohen

An Internet hard drive is your safe-deposit box on the Web—as easy to use and as valuable as Web-based e-mail. The idea is simple: You get a chunk of storage space on a far-off server, where you can stash some files for later retrieval.

Uploading your documents, photos, and MP3s to the Web can take time, particularly on low-bandwidth connections, but you'll have access to those files from any browser on any computer. You also won't have to worry about losing floppy disks, Zip disks, or CD-ROMs. Should your hard disk fail and your backup disks disappear, your crucial files will remain safe, sound, and easily accessible.

We looked at four Internet hard drives: DocSpace Drive, FreeBack, i-drive, and X:drive. All allot you a modest plot of Net real estate—from 10MB on FreeBack (though the site's compression techniques can squeeze many more megabytes into that space) to 50MB on i-drive if you sign up via its partner, MP3.com (you get 25MB otherwise). All hand over the deed free of charge, though some of the services will sell you extra space.

Another service, called Driveway (www.driveway.com), was released just as we went to press. It offers 25MB of free Internet storage, with the opportunity to earn more space by filling out surveys and inviting friends to sign up. You can upload up to seven files at a time, but not entire folders. As with X:drive, you get a handy gauge that tells you how much space you've used and how much you have left. You can share folders with specific individuals, but they'll only be able to view and download files, not upload, delete, or modify them.

With the exception of DocSpace Drive, which is part of a larger package of Web-based collaboration tools, all are geared more toward personal than business use. They're fine for storing a limited number of files you can get to quickly, but for heavy-duty, regularly scheduled Internet backup, you'll want to go with a service such as @Backup, Atrivia, or Connected.

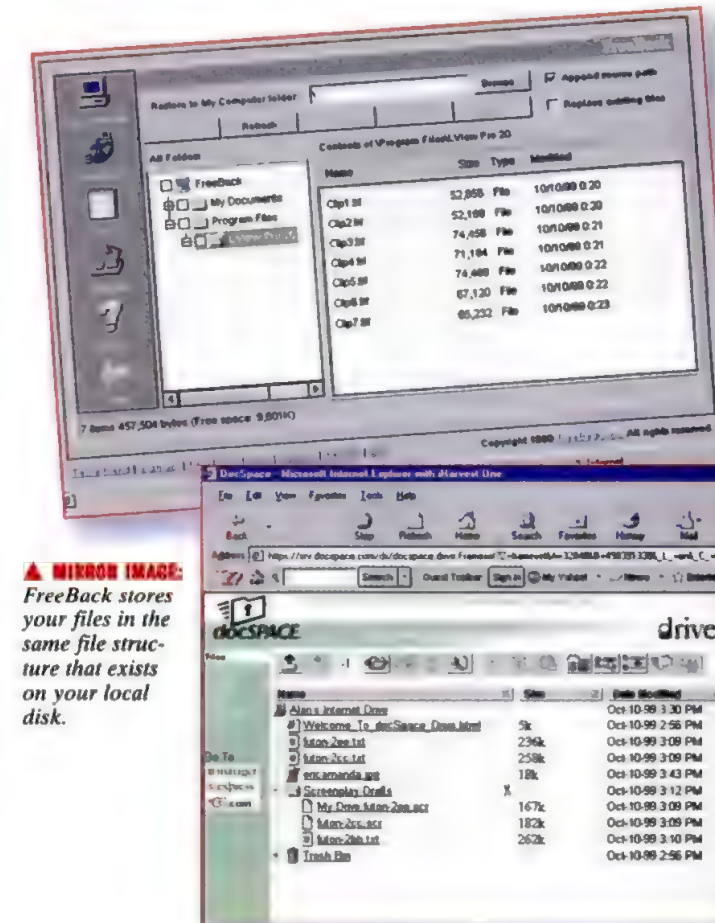
As a personal storage area, each site gets the job done. Upload a file from your browser, and you'll be able to download it at will, in the same way. It's beyond the basics where the services really begin to differ.

For sharing stored files, i-drive is the site to beat. For restoring lost files to your local disk, FreeBack takes top honors. If you want to manipulate your Internet drive within Windows Explorer, X:drive is your only choice. And if you plan to send critical files to others, you'll want to consider DocSpace Drive's superb tracking capability.

DocSpace Drive

DocSpace Drive is part of a larger package called, simply, DocSpace. Geared towards businesses that need collaboration tools, the service comprises Drive, which is where you store your files; Express, which handles document transfers; and Manager, a groupware product. But anyone can sign up for a free account, which provides 25MB of disk space.

By itself, DocSpace Drive has more weaknesses than strengths. For one thing, the service is slow. Even moving a file between folders is an ordeal. First you select the file and wait while the browser reloads the screen—including all the toolbar buttons—and highlights the file. Then you click the Cut button, again waiting for



▲ MIRROR IMAGE: FreeBack stores your files in the same file structure that exists on your local disk.

▲ INTERNET INVENTORY: The DocSpace Drive directory listing shows you at a glance the entire contents of your Internet storage space.

the screen to redraw. Next, you click on the destination folder and wait for the reload that highlights that folder. Finally, you hit the Paste button—and wait for one last redraw.

To download a folder, you must transfer the files one by one or have them sent as a Zip file. Though the latter option can save time, not all folders contain fat files, and anything zipped has to be unzipped, adding another step to the process.

DocSpace Drive fares better when used with its sister utilities. For example, use Express to send a link to a file and you get powerful tracking capabilities, telling you when the link was sent, when it was accessed, and when the document was "picked

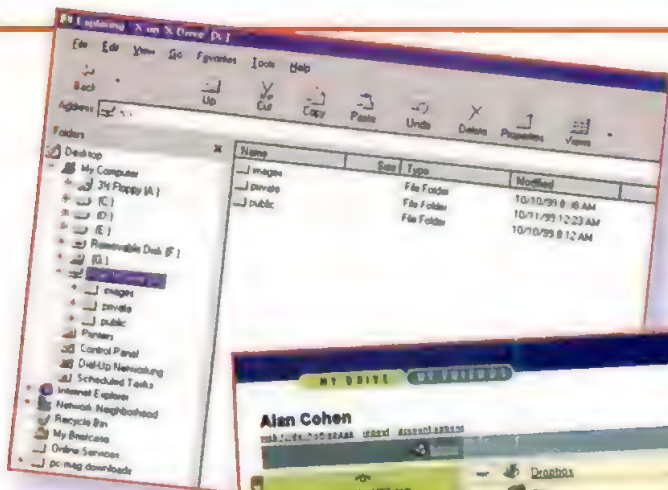
up." That's useful information for crucial transmissions but overkill for simply sharing photos.

DocSpace Drive. Price: Free. The DocSpace Company, Menlo Park, CA; 888-810-3627; www.DocSpace.com.

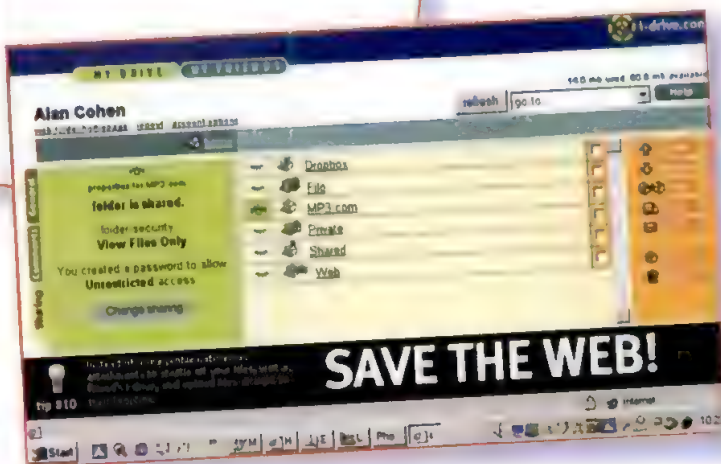
FreeBack

FreeBack cuts right to the chase: You can store files here, you can access them from any browser, but you can't do much else. You can't create folders, e-mail files, or share your data with others. Nor is the site pretty. With icons that look like first-generation clip art, even the interface is strictly no frills.

What FreeBack will do is back up your files quickly and



◀ **FOR X-FILES:** X:drive can be accessed directly within Microsoft Windows Explorer.



► **TOPENER:** i-drive has a slick user interface and unmatched folder-sharing capabilities.

easily and recreate your local disk's file structure in the event of disaster. Log in and you'll see a directory tree of your local system. Select a file or an entire folder to upload; FreeBack saves not only the file but also its directory structure, so files are stored on the Web the same way they're stored on your PC, with the same folders and subfolders.

You'll get only 10MB of free storage space, but that's more than it first seems. FreeBack uses a compression algorithm that can squeeze several times that amount into your personal storage area. A 1.2MB TIFF file was compressed to less than 70K. A 54K Microsoft Word document took up just 17K of space. Better yet, files are compressed before they are sent to FreeBack's server, so transmission times are shortened.

We were surprised that the service lacks the ability to schedule regular backups—something i-drive's Sync application allows. And if you want to share, send, or otherwise manipulate your Web-based files, you'll have to look elsewhere. But to recreate your local disk's file structure on demand on any computer, FreeBack is a handy service.

FreeBack. Price: Free. FreeBack Inc., Reston, VA; 703-264-9800; www.freeback.com.

i-drive

Sure, you can store files on i-drive, but that's like using a helicopter to go to the corner store. It's when you share those files that you'll get the most out of the site.

i-drive lets you create shared folders that other i-drive users can access. But you control the level of access, enabling visitors to view files only, add files only, or have total control (and thereby rename, delete, download, upload, and copy files). Unfortunately, you can't set different access levels for different users.

File sharing is simplified by the "My Friends" tab that can always be found at the top of the screen. Click on it and you'll be taken to your address book, which contains the names of fellow i-drive users. Click on a name and you're taken to that person's own i-drive—though you'll be able to see only shared folders.

i-drive lets you add anyone to your address book, i-drive user or not. For those who don't have

an account, you simply enter their e-mail address. When you send a file, the site routes the file to an i-drive account or sends it as an e-mail attachment, whichever is appropriate. From the address book, you can also create distribution lists for easy file transfers to a group.

The service has some weak points, however. i-drive has an intuitive, attractive interface, but to see the contents of a folder, you have to click on its name and wait for a new page, containing file names, to download. All of the other sites offered a more useful Windows Explorer-like interface, where, at a single glance, you can see every file in every folder.

i-drive lets you upload up to four files at once, but you have to use a separate application, called Sync, to transmit an entire folder. Sync also lets you set regularly scheduled uploads—something no other site we looked at here allows—but you can upload from only one folder on your local disk.

If you plan to store files in multiple folders and subfolders, X:drive, with its superior integration with Microsoft Windows Explorer, is a better option. But

for sharing Web-based files, i-drive can't be beat.

i-drive. Price: Free. i-drive.com Inc., San Francisco; 415-356-2280; www.idrive.com.

X:drive

What sets X:drive apart is a small Microsoft Windows 95 or 98 download that works in conjunction with the service and offers a fast—and familiar—interface. The program lets you access X:drive directly within Windows Explorer, where it looks and functions like any local drive. You can delete and rename Web-based files and folders and drag and drop them to and from your Internet drive. If it weren't for a flashing icon in your system tray, you'd never even know that files were passing over the Internet.

Of course, you can still manipulate files via the browser instead of Windows Explorer, but you're best leaving that option for emergencies. X:drive's browser interface has some useful touches, including a gauge that tells you how much space you have used (you get 25MB) and a hierarchical directory that lists the name, size, and date last modified of every file on your Internet drive. But you can upload only one file at a time.

File sharing is not up to i-drive's standard. You can select a file and hit the Share button, but since there's no address book, you won't get a list of names to select from. Instead, you'll have to enter up to five e-mail addresses manually.

Unlike i-drive, you don't have the ability to send files directly to another user's Internet drive. Instead of sending the file, you can only send a link to it. So if you move, delete, or rename the file, the link goes dead. That said, X:drive's clever integration with Windows Explorer makes up for a lot of shortcomings. **X:drive.** Price: Free. X:drive Inc., Santa Monica, CA; 310-586-6848; www.xdrive.com.



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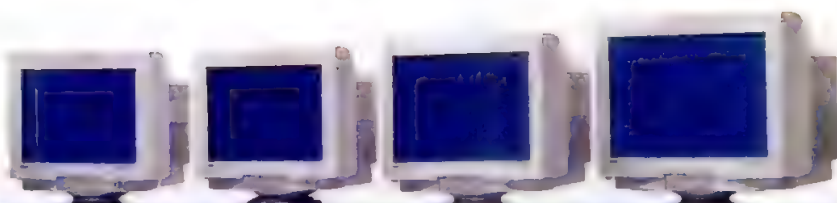


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Get a Little Closer

The Sony Cyber-shot's 5X optical zoom lens is just one of its many attractive features.

By Bruce Brown

There's a lot to like about the new Sony Cyber-shot DSC-F505 (\$1,100 list) 2.1-megapixel digital camera. The DSC-F505's litany of features reads like a prosumer digital photographer's wish list, lacking only an optical viewfinder.

The DSC-F505 is based on a 0.5-inch, 2.1-million-pixel CCD with a top resolution of 1,600-by-1,200 (UXGA). The camera also captures 160-by-112 and 320-by-240 MPEG1 audio/video clips. Using the included 4MB Sony Memory Stick, you can store as many as 63 VGA images and 8 UXGA images, 32 voice memos with images and audio, 160 seconds of 160-by-112 video mail clips (in 15-second clips), and 40 seconds of 320-by-240 presentation video clips.

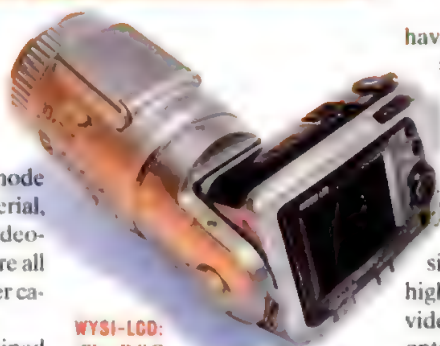
The small (2.5- by 3.7- by 2.0-inch HWD) camera body is paired with a relatively large (5 inches long, 2.5 inches diameter) 5X optical and 10X digital Carl Zeiss zoom lens that attaches to the left side of the camera and swivels up and down 140 degrees. The spot where the 5X optical zoom stops and digital zoom takes over is conveniently displayed on the LCD panel.

You can snap pictures in point-and-shoot mode or, by pushing clearly marked buttons or using a fast on-screen menu, you can adjust focus, exposure, flash mode, white balance, shutter speed, macro mode, image size and quality, and four picture effects (solarization, black and white, negative, and sepia).

Powered by an intelligent lithium ion rechargeable battery (rated for one hour) that displays remaining charge time on the LCD panel, the DSC-F505 fully recharges in just less than 3 hours and can be run on AC power while the battery re-

charges (a fast recharge mode takes just under 2 hours). Serial, USB, and a PAL/NTSC video-out port for presentations are all included, along with transfer cables for each.

In testing we quickly gained familiarity with the DSC-F505's controls and menus. Image quality was outstanding. An in-camera viewing feature lets you zoom and crop a captured image, saving only the portion



WYSI-LCD:

The DSC-F505 has a bright LCD panel for viewing images and on-screen menus, but it has no optical viewfinder.

you want in 640-by-480 resolution. The DSC-F505 does not

have a burst mode, but it took under 3 seconds to capture and process an image shooting in 1,600-by-1,200 resolution in fine mode with the flash on.

The Sony Cyber-shot DSC-F505 is an impressive camera, able to capture high-quality images and useful video clips. If the unit had an optical viewfinder, this might be the perfect prosumer digital camera.

Sony Cyber-shot DSC-F505. List price: \$1,100. Sony Electronics Inc., Park Ridge, NJ; 800-222-7669; www.sony.com.

Business Scanning

The Epson Perfection 1200U delivers crisp, fast scans at a very reasonable price.

By Daniel Grotta and Sally Weiner Grotta

Evolution is the relentless quest toward perfection, and the compact Epson Perfection 1200U (\$250 street) is about as good as it gets. The 1200U offers a pain-free setup, one-button operation, fast scanning time, and a comprehensive software bundle. And image quality is excellent.

The 1200U is a 36-bit device with a hardware resolution of 1,200 by 2,400 ppi, the highest in its class. Epson successfully manages to double the scanner's 1,200-ppi optical resolution along the y-axis by employing precise microstepper motors. Even at lesser resolutions, the 1200U's smooth transverse helps produce more accurate, distortion-free scans.

The scanner has a dynamic range of 3.0, more than adequate for the targeted business user. In addition to an on/off switch, the 1200U has a one-touch button on the front, for launching a preset application.

Setup is so easy and effortless that we were able to produce our first scan in 6 minutes. You first plug in the USB cables, then insert the driver disk, and Epson's

Twain driver is quickly installed. Warm-up takes only 30 seconds.

Scanner operation is not a true one-button procedure, because an interface pops up asking the user to select the application that should receive the image (Adobe PhotoDeluxe, NewSoft's Presto! PageManager, and so on), and launches it. Depending upon your preference, you'll see either the Easy interface, which asks only image type and destination, or the Advanced interface, which allows a variety of prescan adjustments. Interest-

Scanning is very fast. Our 5-by-7-inch test photo, scanned at 300 ppi, averaged 11.9 seconds, one of the fastest times we've recorded with a USB scanner. Image quality is uniformly excellent. Colors are bright and accurate without oversaturation and exhibit crisp, well-defined edges.

There are two other models in the 1200 series: The 1200S has a faster SCSI interface (\$300 street) and the 1200U Photo has an attached 4- by 5-inch transparency adapter (\$350).

The Epson 1200U is everything a business scanner should be at a down-to-earth price.

Epson Perfection 1200U. Street price: \$250. Requires: Microsoft Windows 98, USB port. Epson America Inc., Long Beach, CA; 800-463-7766; www.epson.com.



ingly, neither interface offers basics like Rotate and Flip. The Advanced interface lets you select auto-correct, choose a preset, create and save a custom color profile, and manually adjust brightness, contrast, intensity, and saturation.

SCAN DO: You can be up and scanning in minutes with the Epson Perfection 1200U.

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The Complete Home Suite

In Microsoft Works Suite 2000, home users get less Works and more Suite.

By Edward Mendelson

There's less of the traditional Microsoft Works in Microsoft Works Suite 2000 (\$100 street) than in earlier versions of this all-in-one home-user software suite. But there's more of everything else. Works Suite now fills seven CDs with full copies of Money 2000 Standard, Home Publishing 2000, Encarta Encyclopedia 2000, Expedia Streets and Trips 2000, and a limited version of Picture It! Works Suite is an amazing bargain, and Microsoft has given a consistent Office 2000-style interface to all the built-in programs, but don't expect more integration than you would get if you bought the parts separately.

The original Works word processor has been replaced by a full copy of Word 2000, and the Works communication module has been replaced by Internet Explorer 5 and Outlook Express. All that remains of the central Works program are minimal calendar, spreadsheet, and database modules with hundreds of well-designed templates.

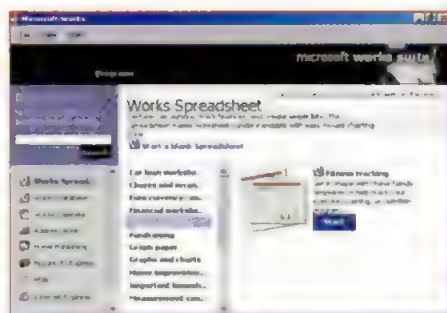
The centerpiece of Works Suite is a new Task Launcher menu that organizes the functions performed by the suite either according to the program that performs them or by the kind of task, such as Household Management or Travel Information. The programs and tasks include such built-in Windows features as Address Book, IE5, and Outlook Express, plus a link to Microsoft Network.

Work Suite's database and spreadsheet can't match Excel or Access in depth of features, but they have all the functions needed for home use. Word 2000 can be overwhelming to home users; the easy-to-use Works Suite word processor (WksWP.exe) is secretly installed in the Works Suite folder.

Money 2000 Standard is Microsoft's personal finance program (First Looks, October 5, 1999). Home Publishing 2000 is a factory for creating template-based invitations, flyers, and more, with a massive collection of clip art, fonts, and sounds. Encarta Encyclopedia 2000 is thorough and graphics-rich; Expedia Streets and Trips 2000 offers point-to-point routing with construction warnings updated from the Internet—but watch out for outdated restaurant listings and a bug that displays two

separate icons for every restaurant with "Café" in its name.

A typical installation of Microsoft Works Suite 2000 fills 785MB, and you can fill 1.4GB by installing everything. In return, you get perhaps the most comprehensive collection of consumer software available in one box. Though we'd like to see more application integration, many home users running Microsoft Office would be better served by Works Suite.



TASK FORCE: Task Launcher guides you to the wizard or application that performs a specified task.

Microsoft Works Suite 2000. Street price: \$100. Requires: 24MB RAM; 785MB to 1.4GB hard disk space; Windows 95, 98, or NT 4.0 or later. Microsoft Corp., Redmond WA; 800-426-9400; www.microsoft.com/works.

AOL Advances

A major upgrade makes world's largest online service even better.

By Bruce Brown

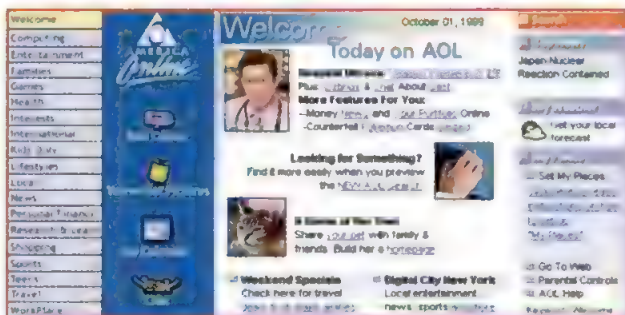
After months of beta testing, America Online recently made AOL 5.0 available. This new version has something for everyone. Major new features in AOL 5.0 include You've Got Pictures, My Calendar, My Places, and a new search engine. AOL 5.0 also has updated service-access functions, screen names, and e-mail handling.

The first thing you'll notice in AOL 5.0 is the new Welcome screen, which combines Version 4.0's Welcome screen with Channels information, plus icons for major new services.

Whether you want to check your mail (or pictures), update or change your calendar, read the news and weather stories, go to special interest areas, or chat online, you can get there from the Welcome screen.

Kodak's PhotoNet partners with AOL for You've Got Pictures. With this service, you take rolls of film to participating photo film processors in your area. After you pick up your negatives and photos, digital versions of the shots are sent to your e-mail account.

My Calendar integrates a personal calendar with a regional- and national-event database.



WARM WELCOME: The revamped Welcome screen puts AOL's content and services just a click away.

You can order tickets directly from AOL for listed events. In My Places, you can customize a portion of the AOL 5.0 Welcome screen, with five slots for areas of the AOL service you frequently visit. This feature would be more helpful if it let you enter non-AOL URLs.

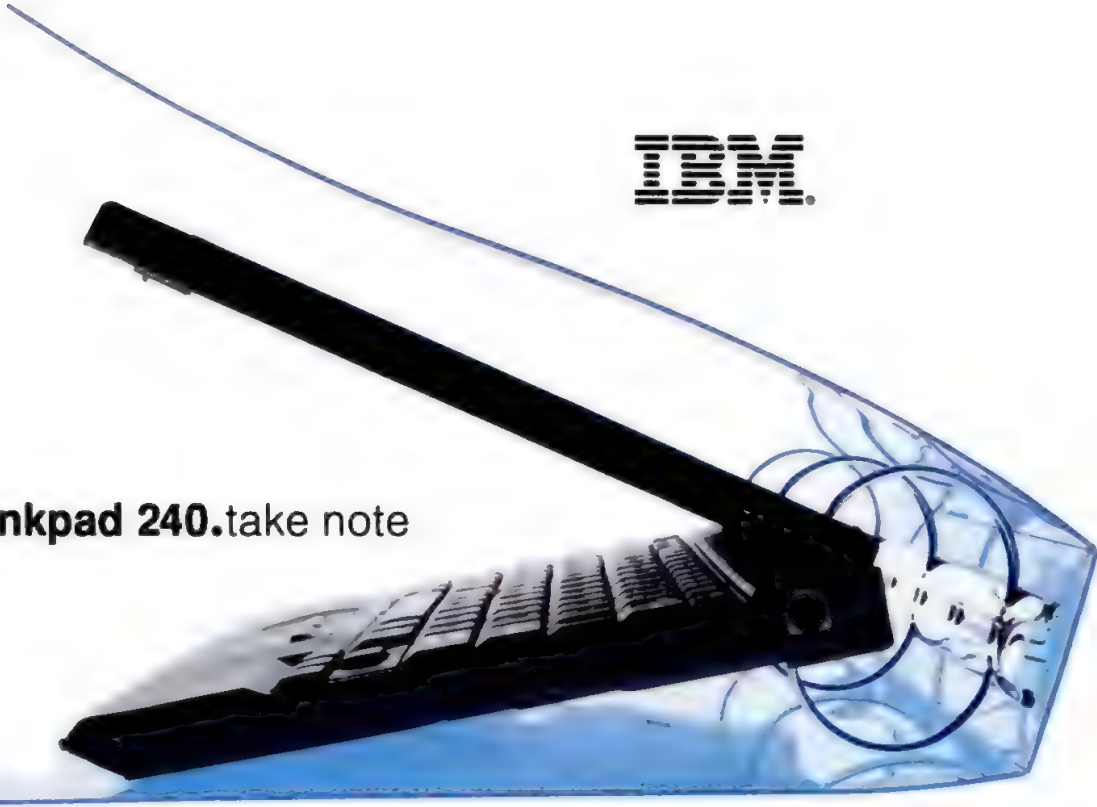
The only problem we had during testing was in installing AOL 5.0 on two test PCs with previous versions of both Microsoft Internet Explorer and Netscape Navigator. In each case, the PCs were on networks, one on a LAN and the other on a WAN. After installation, whenever AOL 5.0 launched, it updated files and then prompted the user to restart the computer to access the Web, even though the program ran just fine. AOL says this is a known problem.

Even as AOL continues to add new services and content, AOL 5.0 makes the online service easier to use, ensuring that its millions of members will stay within the AOL community.

AOL 5.0. Price: For unlimited usage per month, \$21.95; annual and limited pricing plans available. Requires: 16MB RAM, 38MB hard disk space, Microsoft Windows 95 or 98. America Online Inc., Dulles, VA; 800-827-6364; www.aol.com.



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Burn Your Own Tunes

The new HP CD-Writer Music CD-RW drive and software help you make music CDs in a snap.

By Alfred Poor

Let's face the music: The main reason people buy CD burners is to make mixes from their favorite audio CDs. They don't need to contend with packet writing and data formats. Hewlett-Packard has targeted that market with a hardware and software combination: the HP CD-Writer Music (\$300 street).

The hardware component is a CD-RW drive housed in a stylish black case, with blue trim, and a USB interface. The 11- by 7- by 2.5-inch drive has an output jack to connect to your sound card.

The package comes with Music Jukebox, from Sonic Foundry. This software lets you easily drag and drop songs from audio CDs and the Web to create a playlist for recording. In

addition to using tracks from audio CDs, the software also works with WAV, MP3, and WMA files. You'll also be able to access CDDb (www.cddb.com) to obtain artist and track information for your audio CDs.

The Music Jukebox software is designed to comply with copyright protections. It recognizes encrypted information on commercial audio CDs and will let you record their content only on special CD-R media, such as HP Music Digital Audio CD-R Media disks (two are included in the bundle). These also have encrypted identifying information that prevents their contents from being copied again. The disks cost a bit more than standard CD-R disks, because a royalty is paid to the recording industry for each disk. Though this protection

scheme is well intentioned, users could easily circumvent it by the use of other recording software such as Adaptec Easy CD Creator with the drive.

The bundle also includes Neato labeling software for jewel case liners and CD labels, along with sample label sheets and a label-mounting device. The documentation for the entire package is weak, relying on disk-based help files.

The drive itself is rated at 4X write and rewrite speed and 6X read speed. It scored 454 thousand bytes per second on the ZD CD WinMark 99 test. The CD WinBench 99 benchmark test also measured throughput at a constant 878 thousand bytes per second, which is close to the 900 thousand bytes per second pre-



HEAVY METAL: At 5 pounds and nearly a foot long, the HP CD-Writer Music is not a portable solution.

dicted by the 6X specification.

The chief assets of the HP CD-Writer Music package are its relatively low cost and easy USB connection. If you want to create music CDs only, the HP CD-Writer Music is worth a look; if you want to use CD-RW for other purposes such as data backup, you'll be better off with a general-purpose CD-RW drive. **HP CD-Writer Music.** Street price: \$300. Hewlett-Packard Co., Loveland, CO; 800-826-4111; www.hp.cdwriter.com.

CD Creation Made Simple

Easy CD Creator 4 Deluxe lives up to its name, helping you easily create music and data CDs.

By Alfred Poor

Many people are opting for a CD-R or CD-RW drive instead of a plain-vanilla CD-ROM drive, so they can burn their own CDs. Whether used for data backup or a mix of dance tunes, recordable CDs are inexpensive and easy to use, but they have not always been easy to create. Adaptec's new Easy CD Creator 4 Deluxe (\$99 list, \$20 upgrade rebate) gives you all the tools you need—and more—to create all sorts of data and music CDs.

As with many software suites, the program has a unified main-menu window that provides access to its different components. Choose between Audio, Data, CD Copier, Jewel Case Creator, and Photos & Video. The Easy CD Creator option

under the Audio heading lives up to its name; you simply drag and drop files from an Explorer-style window to create the playlist for your new CD. You can mix tracks from other audio CDs, WAV files, and MP3 files. The program also lets you extract CD audio tracks and save them as WAV or MP3 files

for editing. You can write directly to a CD-R or create an image on a hard disk first. And you can access the CDDb Web site to download title, artist, and track information for your audio CDs.

CD Spin Doctor, another utility found under the Audio heading, makes assembling a music CD even easier. You can add special effects and filter out the sound artifacts from vinyl records: The program lets you record directly through your sound card's input channel.

Under the Data heading, you can use the same technique to copy data files. The Take Two utility will back up part or all of your computer's data, spanning multiple CD-R disks if necessary. And Direct CD

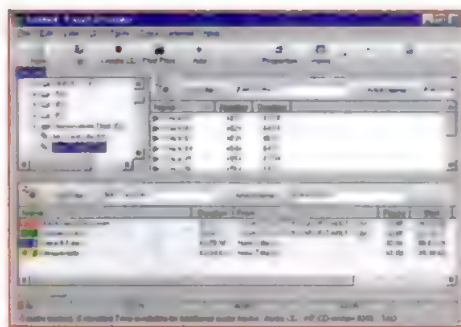
uses packet-writing technology to let you write to a CD-R just as if it were a hard disk, including drag and drop within Windows Explorer.

Also included in the package are a CD Copier, a program to create jewel box liners and CD labels, a sound editor, and a photo editor. In addition, you'll get utilities that let you create photo album or video postcards that you can send to other people.

The package isn't perfect. For example, the thumbnail preview screen for the jewel box utility did not format correctly on our test system. And Direct CD sometimes gets confused about whether it can write to a CD-R that has already been used.

Easy CD Creator 4 Deluxe can help you get the most out of your CD-RW drive.

Easy CD Creator 4 Deluxe. List price \$99. Adaptec Inc., Milpitas, CA; 800-442-7274; <http://cdr.adaptec.com>.



EASY LISTENING: Easy CD Creator's interface lets you drag and drop music tracks from an Explorer-style window to create your playlist.

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(Lap)Linked to the Web

LapLink 2000 adds Internet features to the popular file-transfer and remote-control software.

By Les Freed

When it first arrived on the market in 1983, LapLink provided a simple and effective way to move files between laptops and desktops. LapLink 2000 (\$169.99 list) includes features that made the old LapLink a must-have, and the new version adds Internet and LAN connectivity options.

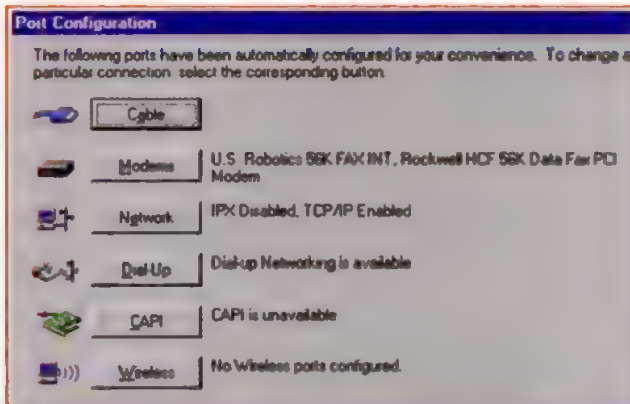
LapLink.com (formerly Traveling Software) has reinvented the product, adding USB to its direct-connect capabilities via an optional USB cable (\$39 list). The LapLink package includes hard-to-find serial and parallel cables.

But the star attraction in Lap-

Link 2000 is the addition of Internet connectivity. Any two LapLink 2000 users can exchange files over the Internet.

LapLink 2000 uses a public Internet Locator Service (ILS) server located at LapLink.com to help LapLink 2000 users find one another over the Internet. Other LapLink 2000 users can't browse the list of users connected to the LapLink ILS server—they must know your exact LapLink user name and have a valid password to connect to your system. All Internet file transfers are automatically encrypted.

Another clever new feature, called LinkToNet, lets you use your office PC and modem as a one-line Remote Access Server



(RAS). LapLink 2000 extends the network services on the office PC—including network print and file services and Internet access—to the dialed-in PC.

LapLink 2000 retains remote-control features; it also retains the SpeedSync file-comparison algorithm that reduces file-transfer times. But its innovative Internet features should

PORTS OF CALL: LapLink 2000 works with every communications port on your PC.

open the product to a whole new audience of users.

LapLink 2000. List price: \$169.99. Requires: 16MB RAM; 15MB hard disk space; Microsoft Windows 3.1, 95, 98, 2000, or NT 4.0. LapLink.com Inc., Bothell, WA; 800-343-8080; www.laplink.com.

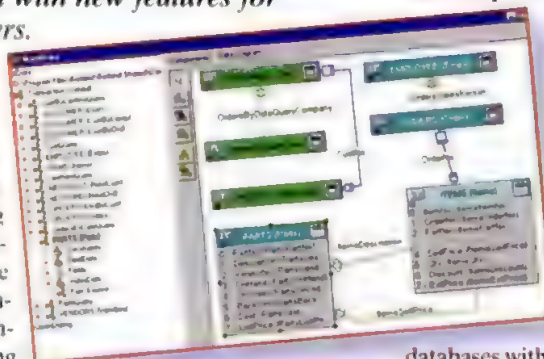
A RAD(ical) Upgrade

Delphi 5 is crammed with new features for application developers.

By Neil J. Rubenking

Delphi is a RAD (Rapid Application Development) tool that is especially well-suited to building Internet, database, and distributed applications. In the latest version, Delphi 5 Enterprise (\$2,500 street), Inprise Corp. has added a long list of new features for both individual developers and development teams.

Inprise's MIDAS (Multi-tier Distributed Application Services) now supports stateless Remote Data Modules. This feature, along with RDM pooling, drastically reduces the network traffic for a MIDAS-based application and permits disconnected database operations with automatic resynchronization. Delphi 5 users can take advantage of MIDAS to produce Microsoft Transaction Server modules without having



BETTER BROWSER: Improvements to the Integrated Development Environment include a powerful Project Browser.

to write custom COM interfaces.

The new "Internet Express" components, XMLBroker and MidasPageProducer, extend the power of MIDAS to create highly scalable Internet applications. Delphi 5's dozens of Internet-specific components include the new WebBrowser, which incorporates Microsoft's Internet Explorer ActiveX object.

Delphi 5 now supports ad-

vanced features of the SQL 7 and Oracle 8i databases, and the ADOExpress components let

programmers use Microsoft's Active Data Objects without the need to import ADO interfaces explicitly. The new Interbase Express permits creation of proprietary databases without requiring the bulky Borland Database Engine. And the extraordinary new Data Module Designer displays and documents the relationships between components.

Among the enhancements to Delphi's development environment are an integrated To-Do list and a versatile Project Browser that replaces the antiquated Object Browser. The Object Inspector can group properties by category, rather than alphabetically, and can hide little-used properties.

The built-in debugger can now attach to a running process

or debug across multiple processes, and its new FPU view displays the contents of the floating-point or MMX registers. New breakpoint actions add versatility to debugger breakpoints.

Delphi 5's new TeamSource workflow management tool runs on top of a traditional source-code control program such as Merant's PVCS. Delphi 5 applications go international with the new Integrated Translation Environment. The Resource DLL Wizard extracts all text strings from the program and builds resource DLLs for selected languages.

Delphi 5 is also available in a stripped-down Standard edition (\$100 street) and a Professional edition (\$800 street). The Enterprise and Professional editions come with lots of extras, including versions of C++ Builder, HotMetal Pro, JBuilder, and a companion CD of handy components.

Delphi 5 Enterprise. Street price: \$2,500. Inprise Corp., Scotts Valley, CA; 800-632-2864; www.borland.com/delphi.



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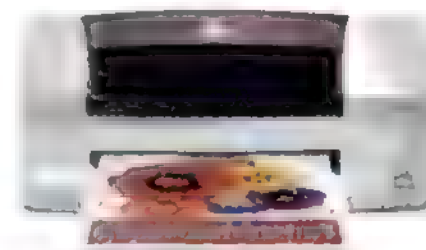
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All For One (IM Standard)

By Jim Lynch

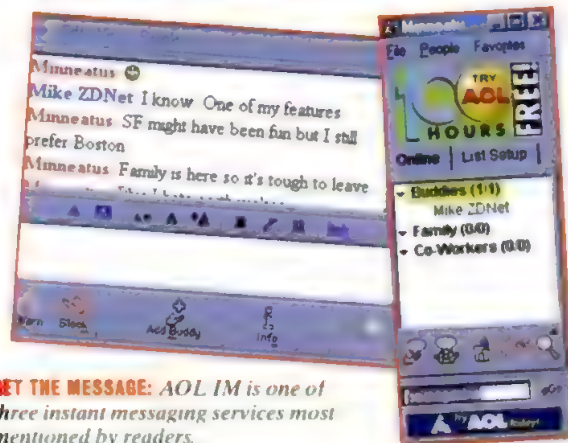
Instant messaging (IM) has come far in a few short years. But have we arrived at a point where using IM is as easy as using e-mail? Unfortunately, the answer is no. Since there is still no standard IM protocol, users still need to have multiple instant messaging clients installed on their systems.

Most of our readers reluctantly seemed to accept this lack of a standard with a certain degree of nonchalance, while expressing the desire to see a universal protocol eventually. Kevin Breit felt that "there should be a standard protocol.... We should all have a handful of different clients that use the designated protocol. Choice is important, but standards are, too. I

think this is a good fine line."

Then there were those readers, like Brandon, who expressed cynicism and exasperation: "When has the Internet ever agreed on a standard? It seems no matter what the new technology is, you need *all* the competing products to enjoy it fully, as different sites and different people want you to use different products." This kind of sentiment makes a standard protocol so important; without it, companies that provide IM services simply won't reach the widest pool of users and consequently won't reap the largest financial rewards.

When it comes to IM clients, our readers overwhelmingly favored the "big three" of instant messaging: AOL Instant Messenger, ICQ, and Yahoo! Mes-



GET THE MESSAGE: AOL IM is one of three instant messaging services most mentioned by readers.

senger. Of lesser importance were MSN Messenger and other IM clients. One reader posted that he "tried AOL IM and wasn't impressed. MSN Chat also left me unimpressed. ICQ is stable, quick, full-featured, and as close to a standard as I think IM approaches."

Instant messaging has also

delivered some unexpected value for those with certain physical disabilities. "For the deaf, instant messaging opens a whole new world of communication that has the potential to eliminate TDY terminals. Businesses should implement instant messaging as an alternative to the telephone for the deaf and hard of hearing," wrote one respondent.

Then there are those who have a different take on instant messaging altogether. One reader spoke for many when he posted a comment asking, "Why would anyone even want *any* kind of instant messaging?" He went on to say that instant messaging is as dumb as bringing a telephone into the shower. **PC**

E-Mail, sans PC

By Bruce Brown

Small e-mail appliances such as the Cidco MailStation aren't intended for *PC Magazine* readers, but they may be the right choice for someone you love. Most reader reactions to our inquiry about using portable mail stations expressed skepticism or criticism about the devices. But doubting readers may be missing the mark.

Reader Donald Cooper made the point clearly when he wrote about the Cidco MailStation, "My 85-year-

old parents are using it successfully and consistently. It is simple, it works, it's fast, and it's portable." His message underscores both the correct target market for Internet e-mail appliances and the reasons these machines are attractive.

If you were to look for a demographic profile of people who don't have, don't want, or don't need to use a computer, you'd have to eliminate all children, all students, and certainly most working people in the U.S. Though many retired people and multitudes of senior citizens do have and use PCs, there are still lots of folks who just don't care to use a computer.

For some, WebTV is a reasonable way to surf the World Wide Web and correspond via e-mail without having to deal with a real computer, but WebTV carries its own threat to those who don't embrace electronic technology willingly. As this author's

mother recently expressed, "Don't mess with my TV. I've figured out how to turn it on, change channels, adjust the volume, and watch rented movies. That's all I want to do with it."

The most successful of these appliances will stick to its purpose and have just a few clearly marked buttons and controls—and highly readable screens.

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Tell us what you think....How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product every week and summarize your comments here. Below are just a few of the comments from our discussion of instant messaging.

Instant messaging is the best thing to hit the Net since e-mail. If only I could have everyone on the same system, things would be perfect. When will this happen? Since no one is in a hurry about it, I would say it'll be five years. But if the Internet community started clamoring and demanding standards that let us communicate with everyone, perhaps something would be done sooner.

—Angelique

These packages are a waste of Internet resources and bandwidth. They are redundant and of little use except an annoyances. Many software vendors force you to install AOL IM when you use their products. I bought RealAudio, and I can't install it now because I don't want anything from AOL on my system. And they will not make it a user selectable option.

—David

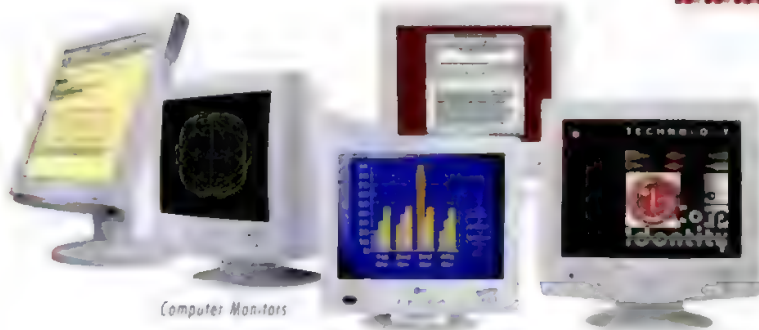


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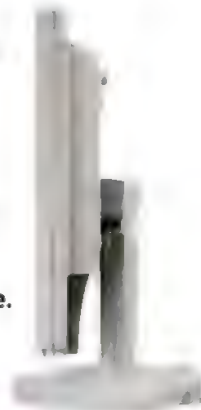
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How Do I Hack Thee?

Let me count the ways. Actually, I can't count them, because there are far too many. The explosion of networking, both local and wide-area, has created unprecedented levels of vulnerability. Once upon a time, the balance between hackers and the people who defend the systems was almost a fair fight.

Although the number of people at the top of the hacking game hasn't changed all that much, the number of people with moderate hacking or cracking skills—and tools—has increased dramatically. But the real population explosion has been among the clueless millions of newcomers to the connected world. The concomitant growth in network and server administrators causes some to be too ill trained or inexperienced to deal with the potential for invading systems.

The situation has been made worse by persistent high-speed connections, such as DSL and cable modems. Combining a persistent connection with file and print sharing leaves the door wide open for people to snoop your files and wreak havoc on your system. When you need to combine a home or small-office network with an Internet connection, the solution is a hardware or software firewall. You need a firewall, because people all over the world are probing your system for weaknesses all the time. You don't see the attacks, because you're not running a server, and the attacks aren't logged unless you're running a firewall that logs its attacks.

Also, many forms of security are illusory at best. Take user and server passwords. Network administrators are often either too lax or too overworked to purge terminated employees off the system, force people to change passwords often, or lock users out after a number of failed log-on attempts. Lockout, even for 15 minutes, can be a big deterrent, and the log files indicate that a security violation is in progress.

Many network administrators have no idea how vulnerable they are to cracking attacks. Password-cracking programs are abundant on the Web; one site has more than 50 of them in its collection. They include crackers for BIOS passwords, Zip files, POP mail, various operating-system log-ons, MSN Hotmail, and even brute-force PGP. I've tried some, and they work. But cracking tools are also invaluable for security audits, because they quickly expose users whose passwords are too easy or don't conform to your company's security policy. My tests show that long, mixed-case passwords with special characters

can add days or weeks to a cracker's task.

One of the most notorious and, by contrast, most helpful crackers is L0phtCrack, which cracks Windows NT passwords from a workstation. One reader, a Windows NT system administrator, tried it from a no-privileges Windows 95 machine and was astounded to find that it uncovered 85 percent of his office's passwords in a mere 20 minutes and that it unlocked all but two in 24 hours.

L0phtCrack is from L0pht Heavy Industries (www.l0pht.com), a hacker group that produces powerful, sophisticated applications and tools. You can download and use L0phtCrack free for 15 days; registration is \$100. L0phtCrack's history is interesting; you should read it. Microsoft first dismissed the program as a "theoretical" threat but has finally embraced it as the ultimate Windows NT password security test tool. If you're wondering if one of your employees read this column before you did and perhaps cracked passwords on your system, forget it. L0phtCrack has been downloaded over half a million times. If your system is insecure, it was cracked long ago.

Meanwhile, a couple of your clever coworkers may have figured out how to put their LAN adapters into promiscuous mode, where they can read all the network traffic, not just the packets addressed to them. This technology is the basis of network sniffers, those handy analytical tools that detect misrouted, damaged packets and other network problems. This is also the basis for massive security leaks.

Once again, L0pht comes to the rescue with AntiSniff, a new program that detects machines that are monitoring traffic. You can try it free for 15 days, and registration costs \$350. The technical files at the L0pht site make fascinating reading. Check them out.

Finally, I've become convinced that you should be running a personal intrusion detector/firewall on your system, such as AtGuard or BlackICE Defender, even if you're behind the corporate firewall. I've detected several intrusion attempts by coworkers. Nothing malicious, mind you, just twisting the knob to see whether the door is unlocked. 



If your system is insecure, it was cracked long ago.

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*** Details of the MSN™ Rebate Program.** This MSN Rebate program requires (1) the purchase of any display device (CRT or LCD monitor) from ViewSonic Corporation from September 1, 1999 through December 31, 1999, and completion of all necessary paperwork by the customer, and receipt of the same by MSN, prior to January 31, 2000; (2) selection of a 36 month membership to MSN Plus Internet Access (\$400 rebate), 24 month membership (\$225 rebate), or 12 month membership (\$100 rebate) at the rate of \$21.95 per month plus applicable taxes; (3) mail-in or online signup (as applicable) prior to January 31, 2000; (4) a valid major credit card of the type generally accepted by MSN; (5) the original purchase receipt; and (6) acceptance of the MSN Internet Access member agreement. You are not obligated to continue as a MSN Plus Internet Access member for any particular length of time, however, if for any reason whatsoever you do not continue for the period of time associated with the rebate that you have elected to receive, you agree that you will repay MSN the amount of the rebate immediately upon termination or cancellation of your MSN Plus Internet Access account; provided that if you are a resident of California or Oregon you will not be required to repay the rebate amount. The MSN Rebate program is available only to residents of the fifty (50) states of the United States and the District of Columbia. You must be 18 years old or older to qualify for the MSN Rebate program. MSN Internet Access is available in connection with the MSN Rebate program only to users of the Windows® 95 or above. MSN Internet Access is available only for personal non-commercial use. Local phone and/or long distance toll charges may apply. It is the customer's responsibility to check with a local phone company to determine if access numbers are local. Local market network activity and capacity may affect access availability. MSN is a trademark of Microsoft Corporation. **MSN Internet Access minimum system requirements:** 486/66 or higher processor with 16MB RAM, Windows 95™ or Windows 98™ operating system, at least 25MB of available disk space, 14.4 Kbps modem or higher, Mouse (req'd) and Sound Card (recommended).

****** Stanford Resources, Inc. Monitrak U.S. Desktop PC Independent Monitor Shipments Q2 '99 and Display Search, Quarterly Supply vs. Demand Study: Desktop Monitors Q3 '99.

Web Computing Stinks

Yeah, Net-based computing is fabulous. It's particularly fun when the Net is down and you have work to finish. Oh, and it's a lot of laughs when the server, over which you have no control, is hacked and all your data is lost or stolen.

The loose alliance between the PC and the Internet will shortly turn into an out-and-out war, as the basic philosophies of Net-based computing conflict with personal computing. This was bound to happen sooner or later. Scott McNealy and his Sun Microsystems henchmen have never liked the idea of the PC. Sun's attacks against Microsoft have really been attacks on the original concept of the standalone PC. So a debate ensues. Unfortunately, what's left out of the equation is the current unreliability of the global network infrastructure and basic security problems. The only good thing is that centralized computing is somewhat cheaper, or so they say.

By 1982, when IBM brought out the first so-called PC, a new trend was established: people owning their own full-fledged computers. They were standalone devices with all the software people needed for basic business or specialty computing. The key to the PC's success was the elimination of centralized control. Business and government were never comfortable with this aspect of personal computing, but they tolerated it. What they couldn't tolerate was the rate of change for hardware and the high cost of never-ending software upgrades. These issues refused to fade.

Worse was the fact that as computing power got cheaper and cheaper, software prices did not fall as fast. I blame this discrepancy for the sudden change in attitude toward PCs. While this relative price stagnation was good for large software companies, these prices have been kept high artificially, reopening the door for central control and networked computing. The situation puts us all at risk, because if the network goes down in such an environment, then we have no computing!

The original trend away from centralized control toward personal computing was, in fact, the correct trend. People should have their own PCs, just as they should have their own toolboxes or their own cars. I like to cite the example of the master mechanics in large factories. The top workers usually have their own toolboxes, which are kept locked up. Sometimes they will loan out tools, but the tools are not up for grabs. Ownership is clear. This model applies to

knowledge workers too. The top dogs have their own machines, as powerful as needed, with software they like. Centralization, however, would not allow this personal control. And Web-centric computing is just a data processing version of public mass transit. This is actually worse than central control. MSN Hotmail, for example, is not controlled by your IT department, and it's not controlled by you, either. Control belongs to a third party—Microsoft, in this instance. Who wants that?

Sun leads the way in trying to wrest the desktop away from the individual by showing how much cheaper it would be to have thin clients running remote Java applications. But the price of thin-client hardware could not fall fast enough to keep up with the aggressive PC prices. That may be ending as prices hit a theoretical bottom based on the price of plastic and steel. Furthermore, there has been a movement afoot to have us use our PCs as thin-client machines running online apps. The next big push is for online "rental" applications (using some form of online Excel for a few days for a dollar or so).

Over the past few months, I've been hearing about all these new models, and I have to laugh, since software rental was always an anathema to these software companies. Exactly how you "rent" Microsoft Word or Excel remains to be seen. I suspect that a lot of secret "use" tracking will become part of the scheme to eliminate piracy. Microsoft will be watching though some TCP/IP spy program is my guess. As for the remote Java apps, Sun claims to have switched most of its internal systems to just such a structure. Thin clients running efficient remote Java applications.

The true future will be a little of this and a little of that, with desktop computing and legacy apps dominating the scene for a long time to come. Sun's saber rattling and Microsoft's paranoia make us think things are going to change drastically. They won't. It's impractical and potentially unreliable, and there's no real reason for change except for already profitable companies to think they are saving money.



Web-centric computing is just a data processing version of public mass transit.

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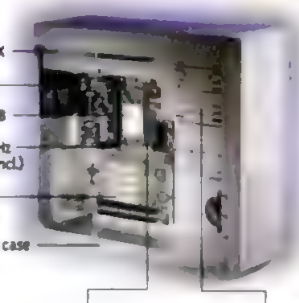
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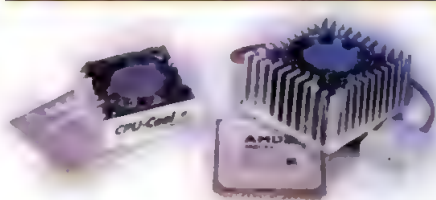
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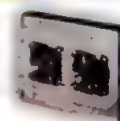
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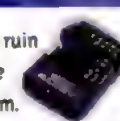
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John C. Dvorak's



INSIDE TRACK

So Close yet So Far Dept.: AMD lost over \$100 million last quarter, despite the fact that it has the **hottest processor** on the market in the new Athlon. The company has also seen its flash-memory business skyrocket, as that market is beginning to boom, thanks to various embedded systems that use the technology. To make ends meet, AMD has decided to sell off its networking chips division. Meanwhile, it's supposedly off and running with the new **K8, or Sledgehammer**, which will compete with the Intel Itanium (the renamed Merced).

I'm kind of missing the old days when chips just had numbers. I suppose I could go into an **elaborate gag about the Itanium name**, but suffice it to say that the name was developed by Buckwheat. (Yes, the old *Our Gang* movie character.) The next chip from Intel, I suspect, will be the Lutonium. Is Intel paying real money for these names?

Meanwhile, the word on the street is that the real reason **Motorola** was lax about providing Apple with enough G4 Power PC chips to meet the demand for its latest workstation is simply that Motorola is **still steamed** because Apple pulled the plug on its promise to license the Mac technology to clone makers. Motorola planned on this becoming a big revenue stream, and now the stream has dried up, leaving just **one customer**—Apple. Motorola itself intended to make Mac clones. Apple is at the mercy of a supplier that **isn't happy** with its customer. Not good, now that Motorola is the sole supplier.

A group of scientists at Cornell are describing a hybrid materials technology that may allow for the production of plastic computer-like displays so inexpensive that they could be disposable. They describe how a **milk carton** might be made from these panels, which could show movement and something like a scrolling missing-children list, for example. I can see it now: **labels on canned goods** that can play reruns of "I Love Lucy." Don't we need to solve world hunger or something?

Microsoft Is Freaked Out Dept.: The company posted a white paper on its Web site comparing Linux with Windows NT, charging that Linux is overrated and doesn't deserve its reputation. I've also seen a **private correspondence** between Microsoft's PR company and various reviewers who are about to review Redhat 6.1 Linux, cajoling them into making sure that if they compare Linux with Windows NT, they get in touch to clear up any misunderstandings. Whatever that means! More interesting to me is that in the correspondence the PR Company keeps calling it Windows *NT* **Instead of 2000**. This, to me, is the sign of deeper delays for 2000.

Get One of these Dept.: For around \$200 you can get a

Voodoo3 3500 from 3Dfx Interactive, which has the Voodoo graphics accelerator and a **TV tuner** in one nice package. The Voodoo3 3000 is the same thing without the tuner. I got one for my son, because he loves to play games online, and **I was stunned** by the level of graphics detail the new cards add to a gamer's experience. Besides speeding up the action, these things add graphics features such as textures and smoke. It's **astounding** to play a game with these Voodoo cards. I've been remiss for not plugging them sooner. They are hot! Buy one. The company has decided to join the open-source movement and released some of its once-proprietary texture compression algorithms. An interesting move.

Sony to Head for Home Dept.: Sony is making an interesting end run of the industry by turning the PlayStation 2, due out next March, into a **home computer**. This comes as no surprise, since the company revamped its marketing and gave the game machine over to the computer folks to sell, even though Sony has shown no signs of previous success penetrating the market. Except for some of its recent VAIO laptops, the company has never done well in the market for various reasons. I'll be interested to see how this team does with an already successful product. The latest specifications for the PlayStation 2 say that it will be **DVD-capable and cable modem-ready**. The plot thickens.

Introduction to Bots Dept.: The computer book market seems to be heating up again, mostly with books about how to make money or how so-and-so made money despite all the obstacles. Meanwhile, look for *BotGuide* by Michael Wolff and Peter Rutten, from HarperCollins (\$19.95). This book will introduce you to the wide world of *bots*—those small pieces of code that go on the Net and work as your agent by gathering information, pretending they are you online, or whatever. *BotGuide* does a good job of introducing you to the basic idea but **fails to even mention IRC** (Internet Relay Chat) bots and other more creative bots. Instead, it considers a virus scanner to be a bot, which is an interesting concept. For in-depth bot information **go online** and ask a search engine for *bot*. A good starting point is www.botspot.com.

Bots are used commercially by a lot of nouveau Web sites, such as those that **monitor multiple auction sites**. AuctionWatch.com, for example, employs a robotic function to survey over 300 auction sites for comparison shopping. If you are into the auction scene, this is a **fantastic service**. Unfortunately, eBay is suing AuctionWatch.com for scanning eBay's auctions and for linking to them. This is a controversial action by eBay, **which suddenly seems clueless** as to how the Web is designed to work. Apparently, once you get rich you get greedy. Go figure. **PC**

I can see it now:

labels on canned

goods that can

play reruns of

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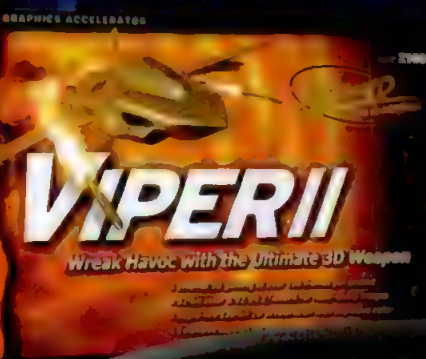
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Opening Your E-Wallet

A useful but little-noticed tech product this year is Microsoft Passport, rolled out in July. A *universal log-on* system, Passport speeds up your use of Web sites by letting you build a single registration record, which Passport then provides—with your permission—to the sites you visit that require registration.

Another step, in other words, toward the presumed Valhalla of One-Click Everything.

Sounds great, but where's the beef? Microsoft is famous for grandiose product announcements but is a little less than—umm—reliable for its follow-up.

In mid-October, Microsoft rolled out the first and probably most important part of Passport, its long-promised “e-wallet” component. This allows you to build a single file with all the information an e-commerce site might need from you to complete and ship an order for goods bought online. You control what's in the file; you determine when the information is made available.

As a frequent online buyer, I want this to work. But e-wallet's success will depend on how quickly Microsoft can make it a universal standard. In the October announcement, Microsoft had a list of cooperating online merchants that included Barnesandnoble.com, Buy.com, Costco.com, and a few others. What Microsoft needs now is a few *hundred* others—including, critically, the leading online consumer-buying sites, such as Amazon.com, Bluefly.com, and so on.

Microsoft faces two private standards already in use: Both Yahoo! and America Online provide one-click wallets for their users, but those are usable only on those services' own online stores. We need open, nonproprietary standards. Microsoft certainly has the clout to establish such a standard, but whether the Redmond gang has the persistence to do the missionary work to sell Passport to a critical mass of Web sites is at least open to question.

This isn't a revolutionary moment in the evolution of the Web, but it is an essential brick in the wall.

Nifty gifts. Every year around this time, I try to anticipate an avalanche of last-minute reader mail by recommending a few moderately priced computer-related devices you may want to give someone—maybe yourself—this holiday season.

Last year, I raved about the Kodak DC260 digital camera as one of the standouts in a crowded field. Both the DC260 and its slightly less expensive sibling, the DC240, became huge sellers for Kodak.

One of the most sought-after but least delivered features in digital cameras is the capability to produce high-quality close-ups. From numismatists to medical researchers to nature lovers, digital camera users want a way to make great close-ups with their favorite cameras.

If you're a lucky owner of a DC260, a DC240, or the earlier DC220, or if you know one, have I got a gift for you. Take a look at www.home.earthlink.net/~crowboy/closeup.html for details on the LensMate, from Susan Doel, an incredibly easy-to-use close-up system for any one of those cameras. It consists of a nicely machined metal sleeve that fits over the camera's lens and mounts solidly, via friction fit, to the large ring where the zoom lens meets the camera body. You screw simple a +1, +2, or +4 diopter lens onto the front of this sleeve, then frame your pictures using the camera's video display.

The LensMate lets you close in on a patch of your subject just 1.5 inches wide, with great results.

Another little-known gift that will bring delight is the series of reproduction CDs from Octavo Editions (www.octavo.com). Octavo has produced a series of stunning CD packages of Acrobat PDF files drawn from rare books and manuscripts, complete with the original illustrations.

There are several broad themes in Octavo's work to date, from nature to early printing and design to the history of science to religion. My favorite so far is Giambattista Bodoni's *Manuale Tipografico*, a reproduction edition of the great pioneering type designer's effort to produce a universal type-specimen book. It's lush, beautifully detailed, and fascinating.

The Bodoni book is also a good example of Octavo's approach. Bodoni's widow published the original in Italy in 1818, in an edition of just 250 copies. Your chances of getting your hands on one of the few surviving copies, even in a rare-books reading room, are essentially nil. And even Bill Gates would have trouble *buying* a copy.

So Octavo worked with the Bridwell Library to produce this lavish two-CD set, just \$50. Using spe-



I want this to work, but e-wallet's success will depend on how quickly Microsoft can make it a universal standard.

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Jim Seymour

cial, high-resolution digital cameras in controlled-light settings to protect the book, Octavo captured an image of each page and plate, and it includes a copy of Acrobat Reader in the package.

Other personal favorites: Galileo's *Sidereus Nuncius* (just \$25), Thomas Bell and Edward Lear's stupendous and beautiful *A Monograph of the Testudinata* (\$35), and John Merbecke's *The Booke of Common Praier Noted* (\$30).

Conceded, these are pretty specialized—but what a compliment to the intelligence of the person receiving your gift!

If you've used any of the Internet long-distance telephone services, such as Net2-Phone, you know how awkward they are to use with PC speakers and a little clip-on or hand-held microphone. A headset with a small boom microphone is a much better answer, in both audio quality and comfort.

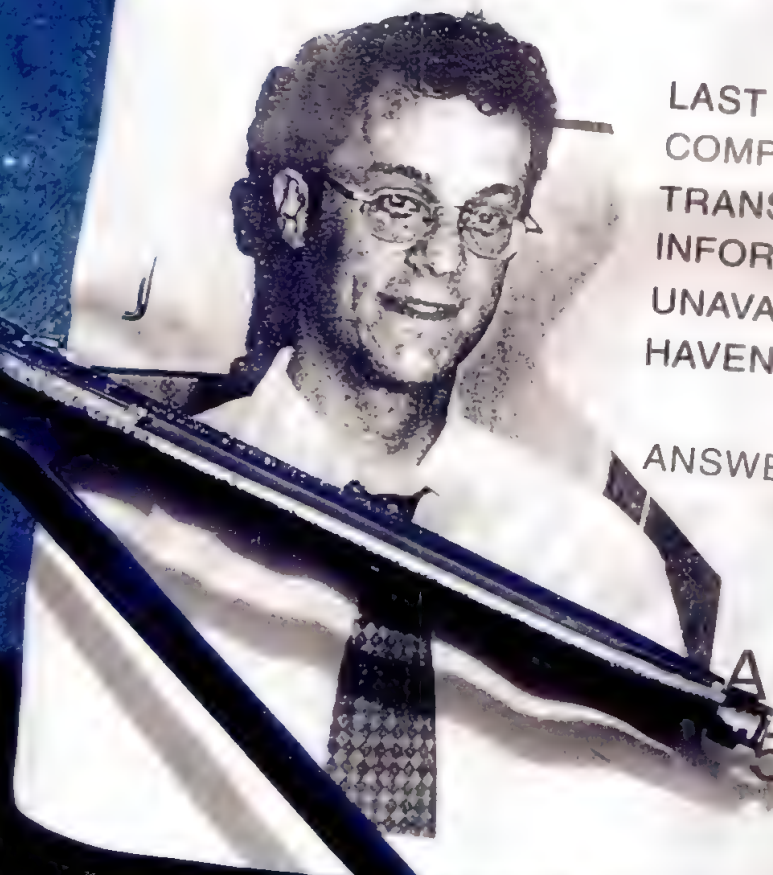
Few headset/mike combinations give very good audio, however, and almost all are ugly and uncomfortable. But Plantronics (www.plantronics.com) has rolled out a line of high-style computer headsets. The SR1, LS1, and HS1, at progressively higher prices, are well made and offer both comfort and good reproduction. I like the rugged monaural SR1 (about \$20) for telephony use; the high-end stereo HS1 (about \$50) is a better choice for playing CDs and listening to MP3 files.

Note that whether you're into Internet telephony or not, these Plantronics units, like any decent headsets, allow you to listen to music and also to escape the irritating noise and Muzak in your office.

Finally, the new Microsoft Internet Keyboard (about \$20) is the best replacement keyboard I've seen in a long time, and it's the first to win me over to the new dedicated-button approach to using the Internet. In addition to nice, light-touch keys and an attractive, swoopy shape, it offers a row of one-touch buttons across the top of the keyboard that accomplish such common Web tasks as jumping a page forward or backward, stopping a page from loading, pulling up your bookmarks, and more. A more expensive Pro version includes more buttons.

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Standards Time

You can put a shoe in the oven, but that doesn't make it a biscuit, folk singer Pete Seeger once noted. In the same vein, proclaiming your new technology to be an industry standard doesn't make it a standard. Here's my take on who's likely to emerge on top in a couple of standards battles brewing in wireless

networking and removable storage.

802.11 (Ethernet) HR vs. HomeRF wireless networking.

Most of 1998's bit players in wireless networking have folded their tents, and we're down to 802.11 HR (802.11 stands for wireless Ethernet, and HR stands for high-rate or 11-Mbps) versus HomeRF. The HomeRF crowd cautiously says that 802.11 makes sense in the corporate office but claims HomeRF will be cheaper and therefore will win out in the home or small office for PC networking, as well as for things like game consoles and cordless phones. Trouble is, I see the early adopters of wireless home networking being the people using wireless Ethernet cards in the office notebooks they bring home; they already have half the cost covered and don't need the hassles of balancing two technologies. **The verdict:** Being cheaper won't be enough to carry the day for HomeRF.

CompactFlash vs. SmartMedia. These are the squarish, nonvolatile memory card formats used in digital cameras, MP3 music players, and the like. CompactFlash (CF) is the thicker one, with more capacity; SmartMedia is credit card-thick and slightly flexible. Although they started out neck and neck, I'm seeing more hardware using CF. CF is currently up to 96MB capacity (\$230 street), with 128MB on the horizon, while SmartMedia is at 32MB (\$100). **The verdict:** CompactFlash. Losing more than half your storage capacity is a stiff price to pay for SmartMedia's slightly thinner form factor.

Sony Memory Stick. The Memory Stick is nonvolatile memory that looks like a gray stick of Dentyne gum and competes with CompactFlash and SmartMedia. It has roughly the same capacity as SmartMedia; 32MB (\$100 street) is the largest commercially available Memory Stick. It's used so far only by Sony, in digital cameras, in video cameras for grabbing stills, and in Sony's new digital-music memory stick Walkman (\$430 list). Only recently has Sony announced that others will license the Memory Stick. The Memory Stick's strength is also its weakness: It can incorporate rights-management controls that artists and recording companies will love, but if these

are too one-sided, users will rebel. The Memory Stick also feels more like a product for individual consumers, and that's bad, because a lot of technology gets popular by being bought for business and brought home for weekend duty. **The verdict:** Sony comes up with more brilliant ideas than just about any other company, but so far, the Memory Stick has the scent of Betamax.

IBM MicroDrive. This is a tiny hard disk about the size of a squared-off poker chip. It's not cheap, at \$500, but capacity is excellent: 380MB now and headed for 680MB next year. The MicroDrive could help build a market in tiny appliances that need on-board storage. **The verdict:** Looks like a winner, at least for specialized uses, with no real competitors.

Iomega Click! The Iomega Click! is a 40MB, 2- by 2-inch disk that showed up earlier this year after being noisily introduced in fall 1997. The Click! Drive was intended to be removable storage built inside, say, digital cameras, but Iomega now cites it as a cheap way to back up data from your notebook or to off-load images from your expensive CF or SmartMedia cards using Click! Drives or adapters that cost \$200 to \$300. Trouble is, there are now plenty of CF and SmartMedia readers that connect directly to your PC or notebook (Lexar gives one away with its memory). So Click! would make sense only for, say, people who take lots of digital pictures on extended trips but don't bring along laptops for off-loading them. **The verdict:** Technically intriguing, Click! may be the answer to a question not enough people are asking.

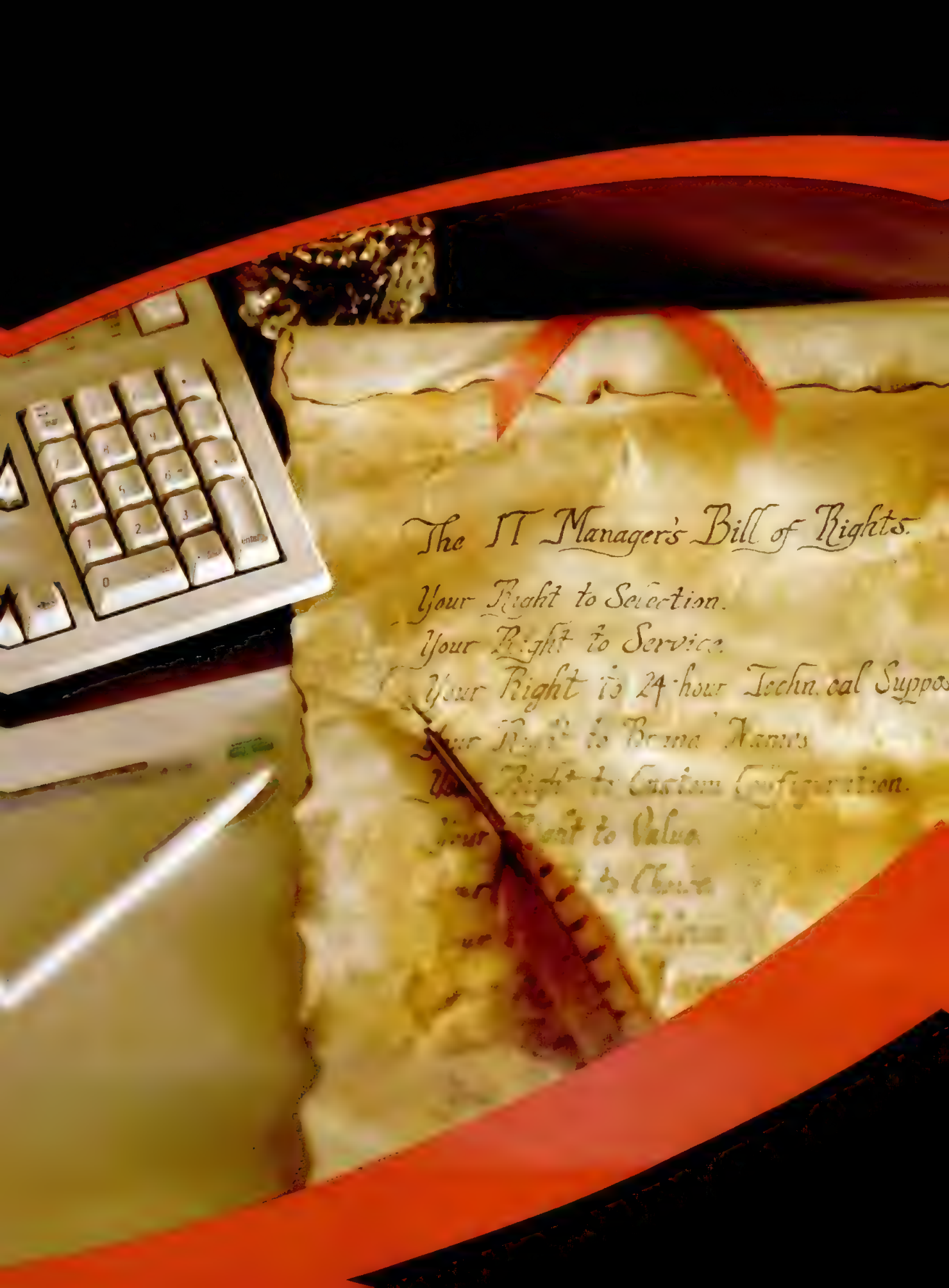
Floppy disk replacements. The Iomega Zip Drive, Imation SuperDisk, and Sony HiFD all want to replace or supplant the much-maligned 1.44MB floppy disk. The Zip Drive has decent capacity with its 250MB version (or the 100MB original), but it can't, of course, read floppy disks. The SuperDisk (a.k.a. LS-120) can, but it's still 120MB. So can the HiFD, at 200MB, but Sony has been slow to deliver in volume. **The verdict:** No knockout winner. Each has adherents, each will survive at least near-term, and all should watch out for CD-RW and then DVD-RAM. **PC**



Although CF and SmartMedia started out neck and neck, I'm seeing more hardware using CF.

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Is the **HP OmniBook XE2** all things to all people? With a 366MHz Intel® Pentium® II processor, 64MB RAM, 4.8GB hard drive, 24X Max CD-ROM, 56Kbps modem, Windows® 98 and a 12.1" active-matrix display stuffed into a 6.6-pound, 1.65-inch thin package, it certainly was designed to be.

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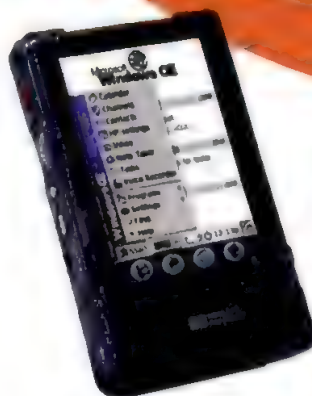
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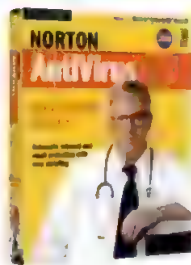
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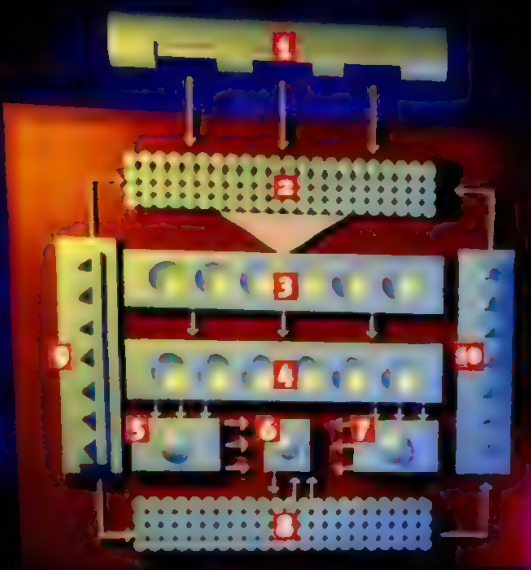
This winter, the high end of the desktop PC market is not what we expected. As late as September, the industry assumed that a majority of the market's fastest PCs would rely on three new technologies: the Intel 820 core-logic chip set (code named Camino), Rambus DRAM (RDRAM) memory, and the 733-MHz Pentium III processor. Yet a delay in the rollout of the 820 has left RDRAM without a platform. Moreover, the new AMD Athlon processor has proved a potent competitor for the fastest Pentiums, giving PC makers an alternative to Intel—and ultimately benefiting consumers.

The result is an unusual diversity of technologies in the current crop of high-end PCs. Among leading systems, the Pentium III/733 ("Coppermine") works in tandem with Via Technologies' Apollo Pro133A chip set and competes with the 700-MHz AMD Athlon CPU. At the next tier, 600- and 650-MHz Athlons compete with 550- and 600-MHz Pentium IIIs. Some systems use SDRAM; others use the new low-latency Virtual Channel memory. Some benefit from the new 4X AGP protocol, others run at 2X. And of course, additional diversity can always be found in the market's graphics engines, which now include the much-anticipated nVidia GeForce 256 processor.

Collectively, the 51 PCs we tested use six different CPUs, three

Illustration by
Visual Logic Inc./Jack Harris

Photographs by
Thom O'Connor



NEW TECHNOLOGY:

Inside the AMD Athlon 700

The AMD Athlon chip has improved the x86 architecture in several ways. Here's where the speed jump comes from:

1. SYSTEM CHIP SET

2. 2-WAY, 64K INSTRUCTION CACHE

The largest x86 L1 cache to date (128K).

3. 3-WAY X86 INSTRUCTION DECODER

The fully symmetric unit can decode any three x86 instructions into one or more "MacroOps."

4. INSTRUCTION CONTROL UNIT

Holds and manages up to 72 MacroOps.

5. INTEGER OPERATIONS

6. LOAD-STORE QUEUE

7. FPU OPERATIONS, 3DNow!, MMX

Includes three pipelined, out-of-order-execution units.

8. 2-WAY, 64K DATA CACHE

9. BUS INTERFACE

System interface bus based on EV6 technology from Alpha processor family; scalable to 400-MHz bandwidth.

10. L2 CACHE CONTROLLER

The high-speed 64-bit L2 cache controller supports 512K to 8MB of L2 cache.

Intel Coppermine

Intel's latest chip not only clocks faster than previous Pentium IIIs, it has a faster cache design as well. Manufactured on a 0.18µ process, it benefits from 256K of on-chip, full-speed secondary cache.

Virtual Channel memory

VCM allocates separate "channels" (which contain small memory buffers) to memory-intensive components (hard disk, graphics card) to reduce data-access latency.

AGP 4X

The 4X iteration of the Advanced Graphics Port standard enables multithreaded direct memory addressing and offers bandwidth up to 1GB per second. These features permit speedier access to larger—and hence more realistic—texture maps for high-end 3-D apps and games.

nVidia GeForce

The nVidia GeForce 256 graphics accelerator chip is the first PC-level graphics engine to integrate a separate transform and lighting processor. Used for years in high-end workstations for 3-D modeling and animation, this approach unbundles the CPU of complex geometry processing for faster 3-D rendering.

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The Millennium combines a 733-MHz Pentium III with the new Via chip set for unsurpassed speed.

However, CyberMax hasn't skimped on business applications (the system's basic bundle includes Corel WordPerfect Suite 2000 and several Compton's Reference titles) or hardware. We were impressed with the unit's audio subsystem and the multimedia features accompanying its Voodoo 3 3500: MPEG-2 video and audio capture, a TV tuner, and an FM tuner.

The Enthusiast performed on a par with most of the competition on ZD Business Winstone 99 as well as our 2-D WinBench tests. It also scored relatively well on 3D WinBench—at least at 16-bit color (the Voodoo 3 couldn't handle 32-bit color at our test resolution). As is the case with many of the market's better known machines, this PC can be purchased and, to some extent, serviced online.—CM

HP Pavilion 8500 Series

Pentium III/733, 32MB ASUS 3800 nVidia TNT2 graphics card, 27.2GB 7,200-rpm hard disk, 10X DVD-ROM drive, CD-RW drive, Iomega Zip 100 Drive, 19" monitor. \$3,050 street. Palo Alto, CA; 800-322-4772; www.hp.com.

● The HP Pavilion 8500 Series is a high-end home PC that rivals most power-user systems. It has the colorful, contoured chassis of a home PC, but it's also ready

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for use in business environments with a 10/100 Ethernet card, a 733-MHz Pentium III chip, and the Via Apollo Pro133 chip set. It's an eminent PC—no matter what your needs are.

Our loaded unit had no available drive bays or IRQs and only one available PCI slot. But it's well equipped straight out of the factory, with USB and serial ports on both the front and the rear of the chassis and an impressive three-piece Polk Audio speaker system. Also, HP loads several effective help tools, including a collection of video tutorials and a customized wizard for accessing the Internet.

The Pavilion scored higher on Winstone than every system in our roundup save the Micron Millennium (the only other Coppermine-based PC). The Pavilion uses the nVidia Riva TNT2 graphics chip rather than the new GeForce chip used by the Millennium, but its 3-D graphics performance was still excellent. In sum, few machines are this fast or this well equipped.—CM

IBM Aptiva S Series 870

Athlon/700, ELSA Erazor III TNT2 Ultra graphics card, 19.5GB 7,200-rpm hard disk, 8X DVD drive, CD-RW drive, 15" LCD monitor. \$3,600 street. Research Triangle Park, NC; 800-426-7255; www.ibm.com/pc/us.

● Though IBM's leading home PC can't match the 3-D performance of machines equipped with the new nVidia GeForce graphics chip, its 700-MHz Athlon CPU affords outstanding performance, and its digital flat-panel display rivals any on the market.

With its \$1,119 flat-panel display, the ebony black Aptiva is not cheap, but you have the option of purchasing the system with a less expensive, CRT monitor. Though we were disappointed with the IBM's on-disk documentation, we had little trouble setting the system up or connecting to the Internet via a customized access wizard.

The unit scored higher on Winstone

than any other Athlon/700 reviewed here, and its 3-D scores—though lower than the scores of several competing machines—were still quite high. Its lack of 4X AGP support isn't much of a handicap for typical business software. Even after loading a new graphics BIOS, though—per IBM's instructions—we experienced intermittent software problems throughout benchmark testing. IBM expects this problem to be solved by the time you read this.—CM

Micron Millennium Max PIII 733/133

Pentium III/733, 32MB Creative Labs Annihilator nVidia GeForce 256 graphics card, 26.1GB 7,200-rpm hard disk, 8X DVD drive, 19" monitor. \$2,676 direct. Nampa, ID; 888-634-8799; www.micronpc.com.



Using the new 733-MHz Intel CPU with the Via Apollo Pro133A chip set, 128MB of Virtual Channel memory, and the nVidia GeForce graphics processor, Micron has fashioned the fall's leading power-user PC. The Millennium performed better with both 2-D and 3-D applications than any other desktop we've tested.

With the Millennium, you should have little trouble with setup or general use. Opening, servicing, and upgrading the system are also quite easy. The Micron Tool Box—a collection of Internet-based applications similar to Compaq's Online Services—wasn't ready in time for our testing, but we were impressed, as always, with the Micron Easy Internet wizard.

Benefiting from the Apollo chip set—which supports Coppermine's 133-MHz front side bus, 4X AGP, and the UltraATA/66 hard disk protocol—the Millennium scored more than 8 percent higher on Winstone than our roundup's average Athlon/700 machine. Using the GeForce chip, the Millennium also scored much higher on our 3D Graphics WinMark tests than all competing machines. Like all Micron PCs, the Millennium is backed by an extensive warranty and a year of on-site service. Until the arrival of 820-based PCs, Micron has the market's performance leader.—CM

SYS Performance 700A

Athlon/700, 32MB Diamond Viper V770 Ultra graphics card, dual 8.1GB 7,200-rpm hard disks, 6X DVD drive, 19" monitor. \$2,999 direct. Cypress, CA; 800-613-9963; www.sys.com.

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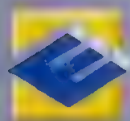
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SUMMARY OF FEATURES

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Fast PCs



	Compaq Presario 5900Z Series	CyberMax Enthusiast A700M	HP Pavilion 8500 Series	IBM Aptiva S-Series 870	Micron Millennia Max PIII 733/133	SYS Performance 700A
■ YES □ NO						
Price of tested configuration	\$3,330 street	\$2,199 direct	\$3,050 street	\$3,600 street	\$2,678 direct	\$2,999 direct
Processor	AMD Athlon/700	AMD Athlon/700	Pentium III/733	AMD Athlon/700	Pentium III/733	AMD Athlon/700
Chip set	AMD 750	AMD 750	VIA Apollo PRO 133	AMD 750	VIA Apollo PRO 133A	AMD 750
Motherboard	Aspen MVB-2	Micro-Star 6167	ASUS Kestrel 2	Acer 530	Tyan Tazer	Micro-Star 6167
BIOS version	Compaq 9.00	Award 6.0	Phoenix	AMI S30ENOV	Award 6.0	Award 6.0
Installed/maximum SDRAM	128MB / 384MB	128MB / 768MB	128MB / 768MB	128MB / 384MB	128MB / 768MB	128MB / 768MB
Hard disks	1	1	1	1	1	2
Formatted capacity	32.6GB	26.1GB	27.2GB	19.5GB	26.1GB	Dual 8.1GB
Manufacturer and brand	IBM Deskstar	Western Digital Expert	Seagate Barracuda	Maxtor Diamond MaxPlus	IBM Deskstar	IBM Deskstar
Rotational speed (rpm)	7,200	7,200	7,200	7,200	7,200	7,200
Interface	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE
Graphics card	Creative Labs Annihilator	3Dfx Voodoo 3 3500	ASUS 3800	Elsa Erazor III	Creative Labs Annihilator	Diamond Viper V770 Ultra
Graphics chip set	nVidia GeForce 256	3Dfx Voodoo 3 3500	nVidia TNT2	nVidia TNT2 Ultra	nVidia GeForce 256	nVidia RIVA TNT2 Ultra
Graphics memory	32MB	16MB	32MB	32MB	32MB	32MB
MPEG-2 decoder	Mediamatics (software)	CinemaStar (software)	Quadrant (software)	DVD Express (software)	Intervideo (software)	Zoran (software)
Monitor manufacturer	Compaq	CyberMax	HP	IBM	Micron	KDS
Screen size (diagonal, in inches)	19	19	19	15 (LCD)	19	19
DVD-ROM drive maker	Hitachi	Toshiba	Pioneer	Hitachi	NEC	Creative Labs
DVD/CD transfer rates	6X / 24X	8X / 32X	10X / 40X	8X / 40X	8X / 40X	6X / 24X
CD-RW drive in tested unit	Compaq	None	HP	Sony	Sony	None
Other mass-storage device in tested unit	None	None	Imaging Zip 100	None	None	None
Audio location	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card
Sound card	Creative Labs SB Live! Value	Aureal Vortex 2	Aureal Vortex AU8830	Aureal Vortex 2	Aureal Vortex 2	Diamond Monster Sound
Speaker model in tested unit (number of pieces)	Klipsch ProMedia V.2-400 (5)	Altec Lansing ACS45.1 (3)	Polk Audio AMR5 (3)	Infinity (2)	Monsoon MC-200 (3)	Altec Lansing ACS-54 (5)
Price of 10/100 Ethernet adapter	Included	\$55	Included	\$83	\$52	\$55
Modem/56K standard	Rockwell/V 90	3Com/U.S. Robotics Winmodem/V 90	Lucent Winmodem/V.90	Rockwell/V 90	3Com/U.S. Robotics Winmodem/V.90	Lucent/Winmodem/V.90
High-speed modem option (price)	DSL (included)	None	None	DSL (\$99)	None	None
Sales staff helps customers find high-speed service	■	□	□	■	□	□
Number of free IRQs	1	0	1	1	1	0
PCI/ISA/Shared expansion slots	5/0/0	4/1/1	4/1/0	5/0/0	6/0/0	4/1/1
Front-accessible drive bays (5.25"/3.5")	3/2	4/1	2/2	3/1	3/2	3/2
Internal drive bays (5.25"/3.5")	0/1	0/3	0/1	0/2	0/4	0/1
Power-supply wattage	200	300	160	200	250	300
Number of parallel/serial/mouse ports	1/1/1	1/2/1	1/2/1	1/2/1	1/2/1	1/2/1
Number of USB/1394 ports	4/2	2/0	2/0	3/0	2/0	2/0
Tool-free chassis	□	□	■	■	■	□
Keyboard supplier	Compaq	Unikey	HP	IBM	Microsoft	SYS
Application/Web site launch keys	■ ■	□ □	■ ■	■ ■	■ ■	□ □
Volume/CD controls	■ ■	□ □	■ ■	■ ■	■ ■	□ □
Live technical-support hours (eastern time)	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days
Standard warranty on parts/labor	1 year / 1 year	3 years / 1 year	1 year / 1 year	1 year / 1 year	3 years / 3 years	3 years / 5 years
On-site service charge for 1 year	Included	Included	N/A	\$99	Included	Included

N/A—Not applicable. The product does not have this feature.

● Equipped with dual hard disks and an IDE RAID controller, the latest SYS Performance 700A is certainly fast, but no faster than our roundup's other 700-MHz and 733-MHz systems. Because it lacks comprehensive documentation, help tools, and Web support, we'd recommend the competing machines from HP and Micron.

The system's tall tower has ample room

for physical expansion (four free drive bays and two PCI slots), but it lacks free IRQs. Compounding matters, SYS provides no documentation save a small motherboard manual. We were generally impressed with the system's five-piece Altec Lansing speaker set and other hardware, but DVD playback ranged from mediocre to poor, and the benchmark test scores were average.

Furthermore, the SYS Web site is not a place where you can purchase machines or find technical support. Obviously, the company isn't as concerned with ease of use or customer service as many competitors are. Performance is a certainly a company concern, but there are many machines that perform as well as the SYS Performance 700A.—CM

BENCHMARK TESTS

Fast PCs: 700- and 733-MHz



New AMD and Intel CPUs, Via's faster chip sets, NEC's new memory architecture, and the new nVidia graphics engine make these PCs blazing fast—even with the Intel 820 chip set delayed.

A number of new technologies turned up for this first part of our "fast PCs" roundup, including the 733-MHz Pentium III (code-named Coppermine), the 700-MHz Athlon processor from AMD, two new Via chip sets (supporting a 133-MHz system bus), Virtual Channel memory (VCM), and an improved graphics architecture from nVidia, as well as 4X AGP and DirectX 7.

The Pentium III/733 was installed in the reviewed HP and Micron systems. While the die size (0.18 microns, versus 0.25 microns for previous Pentium IIIs) made the chip smaller and able to run with less power, it also gave Intel the opportunity to optimize the chip layout. Coppermine moved from Katmai's five-layer metal to a six-layer metal design. This gave Intel engineers the ability to optimize the chip's connections for better throughput. Shorter, more direct traces lead to less propagation delay in signals and better impedance matching. This enables the design to carry the faster frequency we see now (733 MHz, versus 650-MHz for the 0.25-micron process) and faster ones in the future.

Most important, the Coppermine implementation also puts the L2 cache on-chip, cuts it in half (from 512K to 256K), and doubles the speed (it now runs at full CPU speed). Intel's engineers also decreased the L1 cache miss penalty by increasing the bandwidth of the L2 cache. Coppermine can now hit a peak transfer of 11.7 GBps at 733 MHz by transferring 32 bytes (1 cache line) every other clock cycle. They also increased the cache hit rate by upping the set associativity of the L2 cache from 4-way to 8-way. Finally, Intel's designers optimized the system bus with what they call *advanced system buffering*. Simply put, they added buffers to handle the increased bandwidth of the 133-MHz bus. In real terms, this all amounted to the Pentium III/733 beating the Athlon/700 by 1 percent. That's not much of a performance gap in view of the Pentium's speed advantage; we expect to see a same-clocked Athlon beat a Coppermine in integer performance (as measured by CPUmark).

The long-awaited increase in bus speed makes its appearance here—but not by an Intel chip set. Intel was forced to delay its 820 chip set, which allowed Via to ship the first two chip sets that support the 133-MHz bus. The HP uses the Via Apollo Pro 133, while the Micron uses the Via Apollo Pro 133a chip set. The only difference between the two is that the 133a supports AGP 4X.

VCM increases memory bus efficiency by providing a set of registers between the memory and I/O pins, which reduces data-access latency. It uses standard SDRAM with the buffers and their control logic built into the chip set. VCM's strong point is in handling streaming memory requests, which can come from video, audio, and 3-D applications. Streaming data is by definition an always changing data source. By providing *virtual channels* to

memory masters—AGP graphics cards, PCI disk interfaces, network cards, and high-speed I/O interfaces—VCM logic is able to assign blocks of memory across multiple memory banks. The registers keep track of which memory master is using which virtual channel, thus keeping the memory pages within the banks active. By this technique, VCM is able to avoid the page thrashing that can happen in many of today's memory architectures.

For 2-D business applications, ZD Business Winstone 99 shows where the extra speed of the 133-MHz memory bus can help. The Micron Millennium Max PIII 733/133 took top honors. It beat the HP Pentium III system by more than 6 percent.

Though not as fast as the Micron, the HP Pavilion 8500 Series was able to beat all of the Athlon entries. As all six systems had similar disk, graphics, and memory subsystems, the enhancements to the Pentium III and the bus interface certainly play a part in system performance.

Our new ZD Content Creation Winstone 2000 tests measure system performance when using applications for creating Internet content. Unlike Business Winstone, this test suite is extremely disk- and memory-intensive. Therefore, there isn't a close correlation between the two test suites. This time the Athlon-based Cybermax Enthusiast A700M beat out the competition.

There are also a couple of new technologies that affect our ZD 3D WinMark 99 test suite. First, Microsoft released DirectX 7 just in time for our testing. We loaded it on all systems before running the benchmark tests. While 3D WinBench 99 (including our 3D WinMark test suite) does not use DX7 support for hardware transform and lighting, it can garner some small improvements from other DX 7 optimizations. First out of the chute with hardware-assisted transform and lighting is the nVidia GeForce 256. Although unable to benefit from the hardware T&L, the Micron Millennium and Compaq Presario used this card and came in first and second, respectively, thanks to the improved pixel processing (or "fill rate") of the GeForce. With hardware T&L support in our upcoming 3D WinBench 2000 and more refined drivers, expect the performance gap between cards with T&L engines in hardware and those that do not have it to widen.—*Analysis written by Rich Fisco*

How We Tested

We tested all systems running Windows 98 with 128MB of RAM. Each system had 18GB or more of hard disk space. We stripped each system's startup configuration of all processes or tasks except for Systray, Explorer, graphics card control panels, and ActiveX controls. We defragmented the hard disk before each test run and let Windows 98 manage virtual-memory settings. For our 2-D tests we set the resolution to 1,024-by-768 with true color, and set the monitor refresh to 85 Hz. We ran our 3-D tests at both 1,024-by-768 with 16-bit color, and 1,024-by-768 with true color. We set the monitor refresh to 85 Hz in both cases. We ran our new iBench tests on Microsoft Internet Explorer 5.0 at a resolution of 1,024-by-768, with 32-bit color. We cleared the History and deleted the temporary Internet files before each run so caching would not take place.

We used our benchmark test program **ZD Business Winstone 99** to measure performance on 32-bit Windows applications. The Business Winstone tests measure the time a PC takes to execute a

Continued on page 117

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- Mindspring Internet Service⁶
- Netscape® Communicator
- Prodigy Internet⁶

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- Sony BatteryScope
- Sony PowerPanel
- Sony Notebook Setup
- Sony PPK Setup
- Sony Application Recovery CD
- System Recovery CD

Applications

- Adobe Acrobat® Reader
- Adobe PhotoDeluxe® Business Edition
- Intuit® Quicken® Basic 99
- Mediomatic DVD Express
- Microsoft Outlook® 98
- Microsoft Works Suite 99
- Microsoft Word 97
- Microsoft Works 4.5
- Microsoft Money 99 Basic
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- Softlink® in Chorus™
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3MAX+

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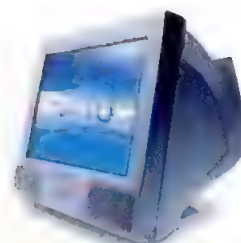
DSC-F55 \$799.00



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- 3X Optical/6X precision digital zoom lens with Auto Macro capability
- Interpolated mega-pixel
- SXGA Resolution (1216 x 912)
- 4X high-speed floppy disk drive

MVC-FD83 \$699.00



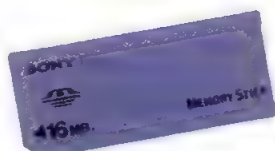
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Virtually flat, high contrast, high resolution 17" (16"VIS) display with built-in multimedia speakers.

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SONY

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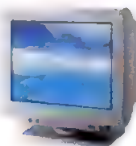
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BENCHMARK TESTS

ZD iBENCH

▲ High scores are best.
▼ Low scores are best.

Bold type denotes first place.	Product	(seconds)▼	(seconds)▼	(seconds)▼	second▲	second▲	(score)▲
Athlon/600	NexTrend NexStar-2000	19.6	11.8	3.9	318	7.3	70,645
Athlon/600	SYS Performance 600A	17.4	11.4	3.8	306	8.3	71,794
Athlon/650	Wintec Ultimate Edge/A	16.0	10.3	3.6	326	8.9	77,276
Athlon/700	Falcon Northwest Mach V	16.5	9.8	3.6	348	9.4	80,577
Pentium III/550	Highwave PPH550	20.1	13.0	4.6	304	6.4	53,580
Pentium III/550	Maximus Power Max 550	18.7	11.7	4.4	331	6.8	55,643
Pentium III/600	Racer PM600I	19.1	11.6	4.3	228	6.7	59,740

◀ These six iBench tests are mostly CPU and graphics-intensive, showing the relative strengths and weaknesses among the differing hardware in our sample machines. The Falcon Northwest Mach V bested the field, thanks to its top-performing subsystems.

Continued from page 110

set of scripts that exercise eight Windows 98 office-suite applications and an Internet browser. The scripts include task switching between a suite application and the browser. Business Winstone 99 weights a PC's test timings based on the applications' unit market shares; it derives a composite number and converts that to a relative score. (The score is relative to the performance of a Pentium MMX/233-based Dell Dimension with 32MB of RAM, at 1,024-by-768 resolution with 24-bit color, running Windows NT 4.0 with Service Pack 3. Its program score is defined as 10.0.)

CPUMark 99 is a benchmark test program that lets you measure the speed of a PC's processor subsystem, which includes the CPU, RAM, and RAM cache. CPUMark 99 emulates the CPU activity of the real-world 32-bit applications in Business Winstone 99. Since the applications in Business Winstone 99 do not use floating-point or MMX instructions, neither does CPUMark 99.

This year we introduce **ZD Content Creation Winstone 2000**. Similar to our other Winstone tests, Content Creation Winstone measures the overall performance of a Windows 98 or Windows NT PC while running a number of today's top Internet content creation applications: Adobe Photoshop 5.0, Adobe Premiere 5.1, Macromedia Director 7.0, Macromedia Dream Weaver 2.0, Netscape Navigator 4.6, and Sonic Foundry's SoundForge 4.5. The test suite focuses on application "hot spots": the subsystem-intensive moments where users have to wait for their PCs to catch up. (Each score is relative to the performance of a Pentium MMX/233-based Dell Dimension with 64MB of SDRAM, at 1,024-by-768 resolution with 24-bit color, running Windows NT 4.0 with Service Pack 3. Its score is defined as 10.0.)

In this issue we also introduce **ZD i-Bench**, a comprehensive cross-platform benchmark test suite that tests your Internet client's performance and capability using the latest Internet Web technology and features. The clients can range from a browser on a PC with a landline to a wireless hand-held device—anything that can display standard HTML. The benchmark program provides a series of tests that measure both speed and the scope of the client's features. We ran only some of the tests on selected systems with varied architectures. The **Load Text-Based Pages** test measures how quickly your browser can load pages and scroll them, reporting the score in seconds. The **eXtensible Markup**

Language tests are processor tests that measure how quickly your browser can download, format, and display XML pages; we report the scores in seconds. The **QuickTime Effects** test is graphics-intensive and measures how well your browser and the QuickTime plug-in handle the effects QuickTime uses to make the transition between clips. The test uses QuickTime support for the Society of Motion Picture Transitions protocol to move between two GIF images. It includes all supported transitions as it moves as quickly as possible through 160 frames and reports the score in frames per second. The **VRML** test is graphics-intensive and tests 3-D performance by measuring how well your system and a VRML client display a clip modeling a moving helicopter, reporting the score in frames per second. The **Java VM** test, a processor test, measures how well your system handles processor work with Java VM.

We used 3D WinBench 99 to evaluate 3-D graphics performance and to assess each system's ability to execute certain 3-D rendering features. (We were unable to run our new 3D WinBench 2000 on the systems, because it depends on DirectX 7, which was available only late in our testing. We used DirectX 6.1a, which comes installed with Windows 98 Second Edition.) We first perform the 3D Quality test to determine which features each graphics card supports. We then run the performance portion of 3D WinBench 99 to obtain the **3D WinMark 99** score. The suite is made up of 15 scenes; each scene is rendered by hardware if the graphics card was found to support all the 3-D options in the scene during the 3D Quality test. If not, the scene is not rendered.

We ran further tests on our 550-, 600-, and 650-MHz PCs (page 150). **ZD WinBench 99** measures a system's graphics, disk, processor, and CD-ROM performance under Windows 98. The **ZD Business Disk WinMark 99** score is based on a log of GDI operations used by the applications in Business Winstone 99. The **ZD Business Graphics WinMark 99** score represents the performance of each machine's graphics subsystem under Windows 98.

The **ZD CD-ROM WinMark 99** tests gauge the performance of each machine's CD-ROM subsystem, which includes the CD-ROM drive, adapter, and required software drivers. The tests are based on a profile of today's most popular Windows CD-ROMs. We tested the DVD drive that was required on all systems. We report the score in thousands of bytes per second.

► On our **Business Winstone 99**, **CPUMark 99**, and **3D Graphics WinMark 99** tests, the Micron Millennia Max PIII 733/133 held a performance edge over the HP Pavilion 8500 Series, thanks to 133-MHz Virtual Channel memory and an nVidia GeForce 128-based graphics accelerator.

High scores are best.		ZD Business Winstone 99		ZD CPUmark 99		ZD Content Creation Winstone 2000		ZD 3D WinMark 99	
Bold type denotes first place.		Processor		1,024 x 768, 16-bit color		1,024 x 768, true color			
■ denotes Editors' Choice.									
Compaq Presario 5900Z		AMD Athlon 700		27.4	63.8	28.2	1,190	916	
CyberMax Enthusiast A700M		AMD Athlon/700		28.8	63.1	30.1	1,060	N/A	
HP Pavilion 8500 Series		Pentium III/733		29.4	62.3	23.8	995	695	
IBM Aptiva S-Series 870		AMD Athlon/700		28.9	63.5	28.3	877	824	
■ Micron Millennia Max PIII 733/133		Pentium III/733		31.3	65.8	29.2	1,220	929	
SYS Performance 700A		AMD Athlon/700		28.6	62.8	29.3	1,100	780	

N/A: Not applicable. The machine could not run this test at this color depth.

Product Graphics

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Presentation files?

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And the winner is...

The Microw Millennium Max, PIII 733/133 is the fastest x86 desktop machine PC Magazine Labs has tested to date. Here's how it compares with the fastest from a year ago:

1999

Microw Millennium Max: Intel Pentium III/733 processor, 128MB RAM, 24.0GB ATA-4 hard disk, 32MB nVidia GeForce 256 graphics. \$2,676
ZD Business Winstone 99 score:

31.3

1998

NEC Direction SP E450: Pentium II/450 processor, 128MB RAM, 13.8GB ATA-33 hard disk, 16MB nVidia RIVA TNT graphics. \$3,200
ZD Business Winstone 98 score:

24.7



FAST PCs

By
Jamie M.
Bsales

BUYERS' GUIDE

All of the PCs
We tested are
FAST, but
which are
the **BEST**
buys overall?
This guide
should help.



Faster processors, advanced memory, improved data buses, and revolutionary graphics engines help make the current crop of professional PCs almost twice as fast as the best models for the PC enthusiast just a year ago. This Buyers' Guide shows you the performance levels you can expect from the hottest CPUs available: the AMD Athlon (available in speeds up to 700 MHz) and the Intel Pentium III (now topping out at 733 MHz). More important, you'll find ratings on the 51 machines tested by PC Magazine Labs, from our ratings for ease of use and Web support to the value for the dollar each machine delivers.

The PC Labs technicians show the ratings (from poor to excellent) for each machine in six categories. Four of those ratings—*setup and getting started*; *installing in the OS*; *remote technical service*; *support*; all have ratings—come from PC Magazine Labs' base of field testing. Admittedly, our requirements are demanding, but even so we're surprised at how poorly most of the reviewed machines fared. When you're spending from \$2,200 to as much as \$5,000 on a new PC, we don't think a quick-start guide and documentation specific to that model are too much to ask for. But these items are rarities, and nearly half of the 51 machines received a rating of *poor* in all four categories. Ratings were somewhat better in the other categories, but as you can see from the accompanying chart, vendors have a long way to go. We've also included here our Price/Performance Index, a visual representation of each product's features and performance relative to others in its price class. Keep this guide handy as you compare PCs to make sure that you're getting a good machine for the price.

Photographs by
Thom O'Connor

CyberMax Enthusiast PIII
A700M

CyberMax Enthusiast PIII
800RM

Editors' Choice
Dell Dimension
XPS T600

DTK APRI-80M/PIII600

Falcon Northwest Mach V

Future Power Series
FP-7850D

Gateway Performance 550

Hertz P550I

HP Pavilion 8500 (PIII/600)

HP Pavilion 8500 (PIII/733)

HiQ Impact 2000 Plus-600

Highwave PPH550

IBM Aptiva S-Series 865

IBM Aptiva S-Series 870

Kingdom Pinnacle 600S

Maximus Power Max 550

MaxTech MXA600S

MaxTech MXP600S

Mega Impact PIII

Micro Express MicroFlex-
72A

Micron Millennia Max PIII
600

Editors' Choice
Micron Millennia
Max PIII 733/133

NexTrend NexStar-2000

NexTrend NexStar-Pro

PC Connection Epiq BPS
8000

Polywell Poly 80089

INTEL

Pentium III/450 \$1,350

Pentium III/450 \$1,950

Pentium III/450 \$2,350

Pentium III/450 \$2,750

AMD

Duron 500 \$2,150

Duron 500 \$2,350

Duron 500 \$2,850

Duron 700 \$2,750



PC VENDORS

Here's how our readers rated the major PC vendors in our 12th annual Service and Reliability Survey (PC Magazine, July 1999):

	Units needing repair over the past 12 months	Selection with reliability	Selection with repair	Selection with tech support	Buy again?
AST	●	●	●	●	●
Compaq	●	●	●	●	●
Dell	●	●	●	●	●
Gateway	●	●	●	●	●
Hewlett-Packard	●	●	●	●	●
IBM	●	●	●	●	●
Micron	●	●	●	●	●
Quantex	●	●	●	●	●
Sony	●	●	●	●	●

● Significantly better than average ● Average ● Significantly worse than average

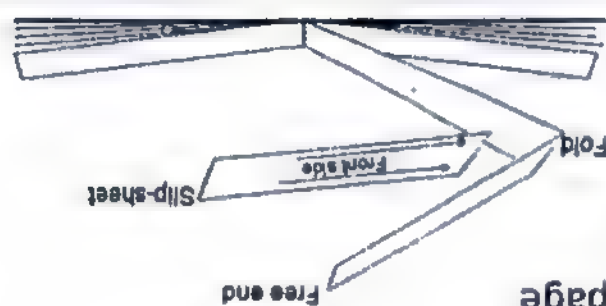
Editors' Hot Links

www.lantronix.com/hotlinks

Visit our website to learn more about the products and services that are the most popular among our readers. For the 12 months ending June 30, 1999, the most popular products and services were:

Popular Products and Services

1. Dell Dimension XPS T600 (PC Magazine, July 1999)
2. HP Pavilion 8500 (PIII/600) (PC Magazine, July 1999)
3. Gateway Performance 550 (PC Magazine, July 1999)
4. Micron Millennia Max PIII 733/133 (PC Magazine, July 1999)
5. NexTrend NexStar-2000 (PC Magazine, July 1999)
6. PC Connection Epiq BPS 8000 (PC Magazine, July 1999)
7. Polywell Poly 80089 (PC Magazine, July 1999)



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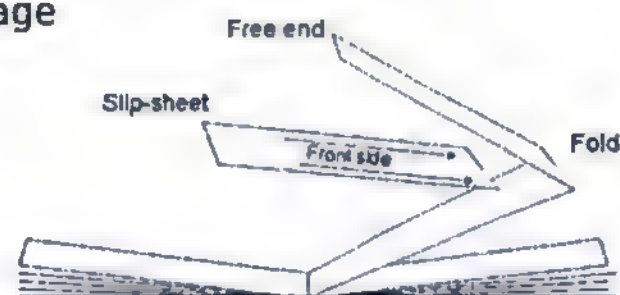


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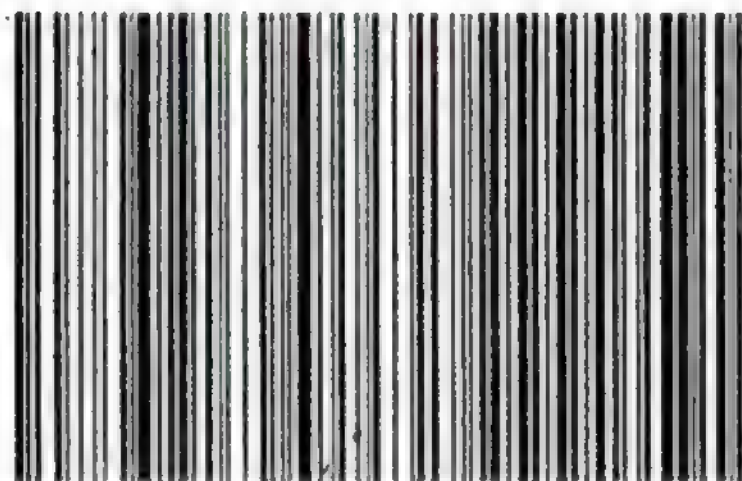
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Back

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PC Magazine Labs Scorecard

In the **setup and getting started** portion of PC Magazine Labs' Ease of Use script, our reviewers look for documentation and utilities that make it easy to get the system up and running. We expect to find a quick-setup poster or guide, color-coded and well-labeled cables and connectors, and full system documentation. Setup videos and instructions on upgrading are a plus.

All Windows-based PCs now include Microsoft's Internet Wizard, so to score well in **connecting to the Internet**, a system has to go above and beyond. We like to see options and pricing explained for a range of ISPs, a long-term ISP membership included, and easy setup of dial-up options.

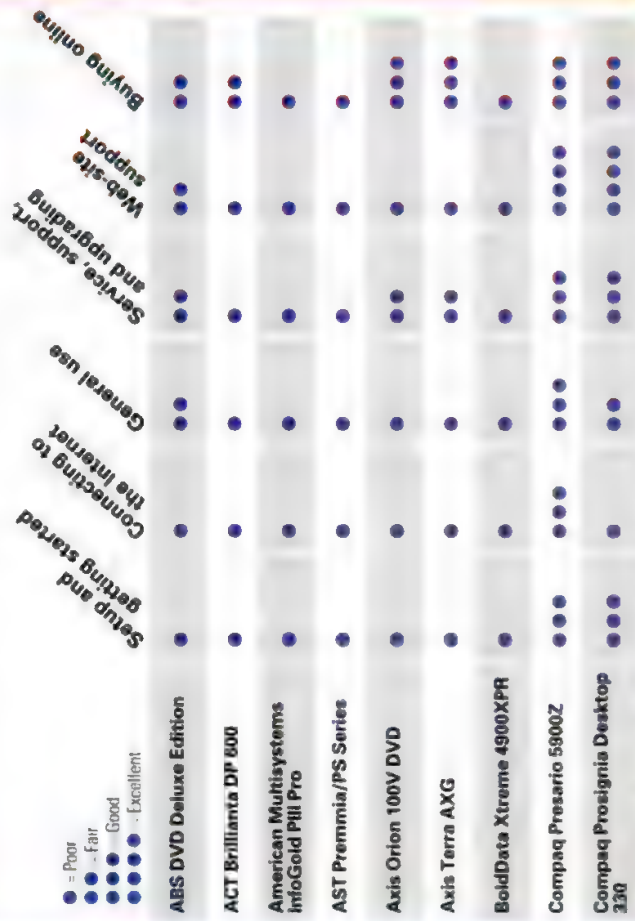
In the **general use** category, we find that the devil is in the details. Does the power-saving mode work reliably? Are the monitor and multimedia

controls easy to use? Does the unit have quick-launch application and Internet hotkeys? And, important, how quiet is the system?

in **service, support, and upgrading**, we look for a troubleshooting guide that covers all the system components; easy access to interior components, free slots, bays, and IRQs; and a comprehensive warranty.

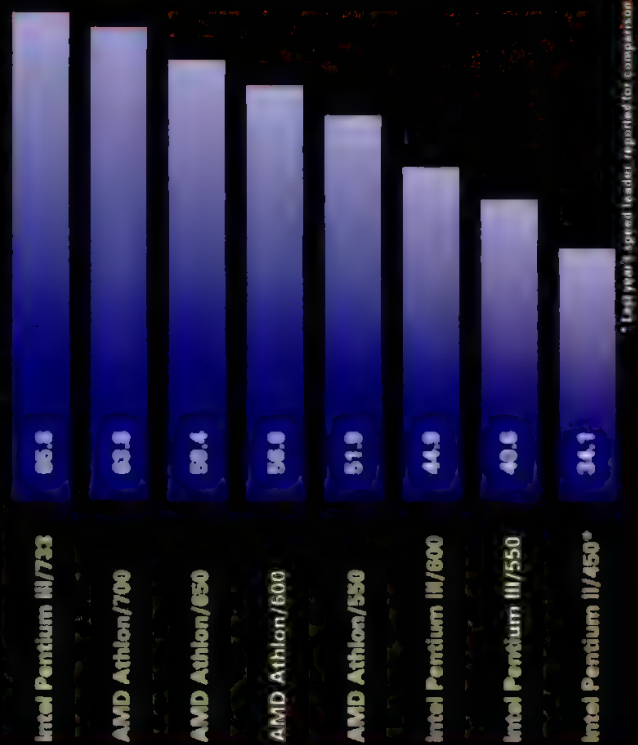
Our **Web-site support** rating indicates how user-friendly and complete the vendor's site is. We look for complete (and up-to-date) system specs and a way to contact technical support. Driver updates and troubleshooting support are pluses.

Buying online should be straightforward and secure. We check to see whether you can order via the site, configure a system (and get an accurate price), easily compare models, and return a system if necessary.



The Fastest PCs Yet

with the coming of Intel's 733-MHz Pentium III and the 700-MHz Athlon processors from AMD, this crop of performance desktops is the fastest ever tested by PC Labs. Here's the relative performance you can expect to see, based on our ZD CPUmark 99 benchmark scores.



• Last year's speed leader reported for comparison,

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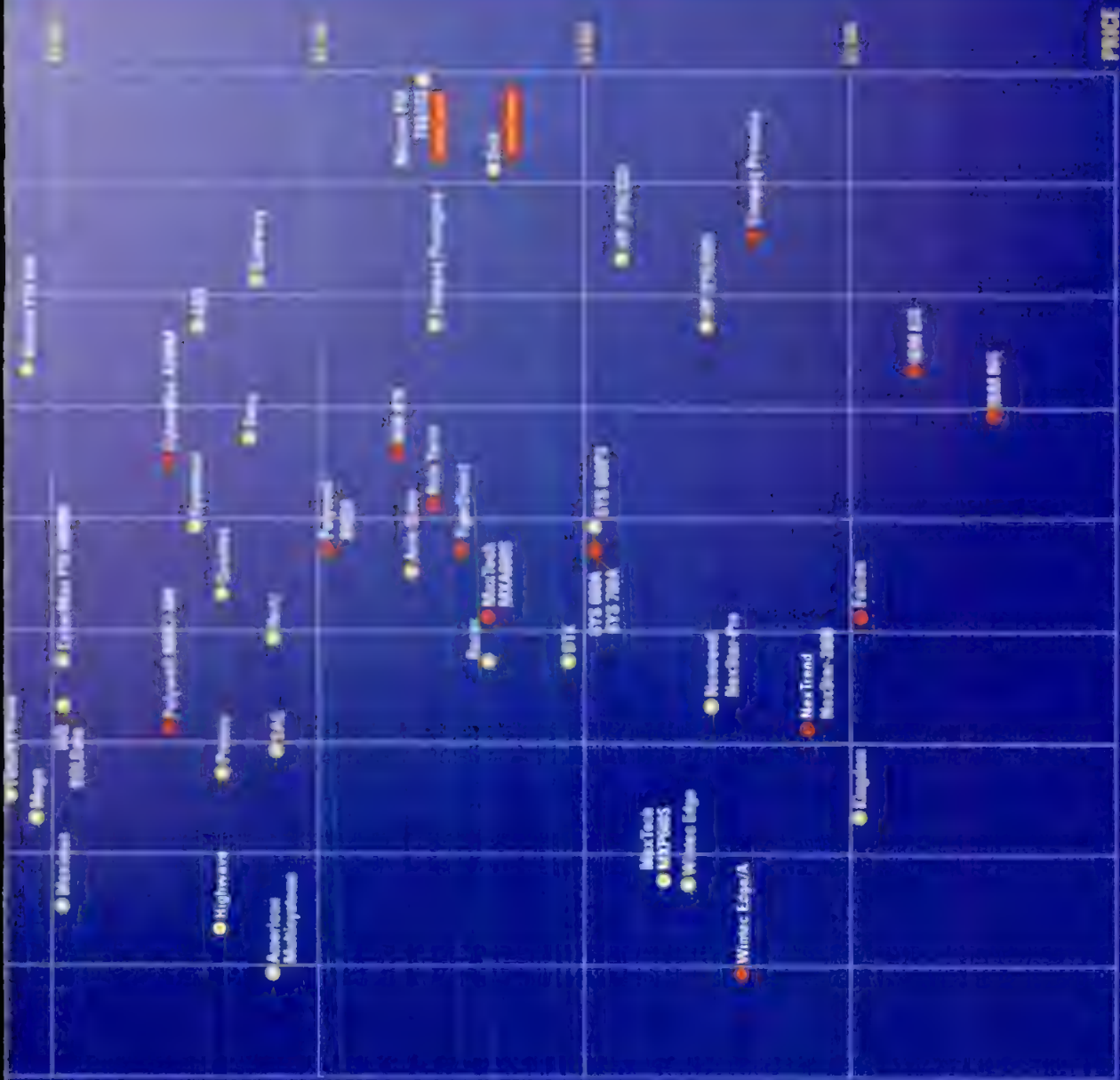
Dell Dimension XPS 7800. Though slightly pricier than the Micron, it includes in its \$2,009 cost a year of Internet service and an on-site repair warranty. Among the other top finishers, the Micron Millennia Max PIII 800 and the Tangent Medallion are worthy of note. They received good overall scores and are each priced below \$2,000. Systems from ABS and Gateway also deliver impressive bang for your buck.

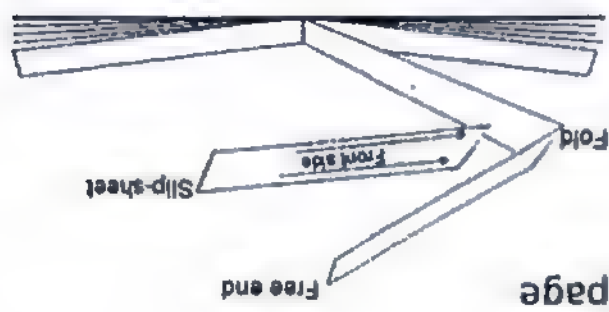
As you study the chart, note that the seemingly steep prices of the DTK, HP, IBM, Kingdom, and Mactech bundles each include the cost of a 15-inch LCD flat-panel monitor, which typically adds \$800 to the system price versus a 17-inch CRT monitor. Likewise, the Falcon Northwest Mach V is a gamer's delight that comes with a gorgeous 21-inch ViewSonic monitor. Factoring these luxuries out, the HP and IBM systems wind up back in the hunt.

THE DATA POINTS Performance accounted for 25 percent of the overall score. Features and components accounted for 43 percent, with a system getting extra points for a CD-RW or other removable-media drive, and a good sound card and speakers. The other factors making up the overall score were support policies (10 percent), expansion potential (10 percent), and our PC Labs Scorecard ratings for ease of use and Web support (12 percent).



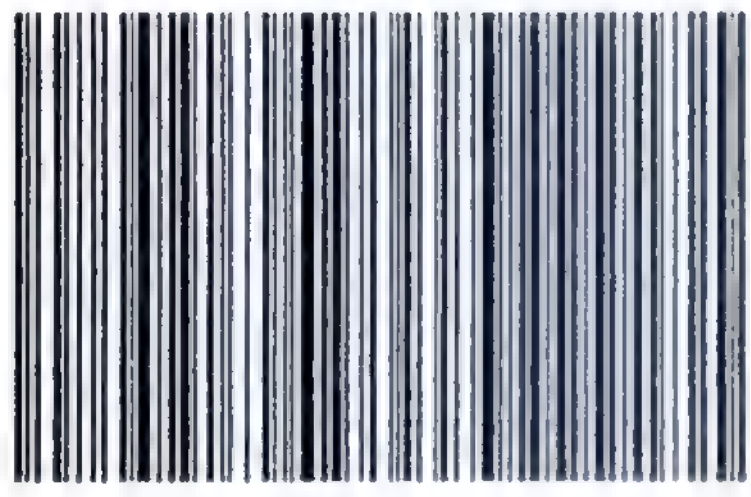
◀ Micron
Millennia
Max PIII





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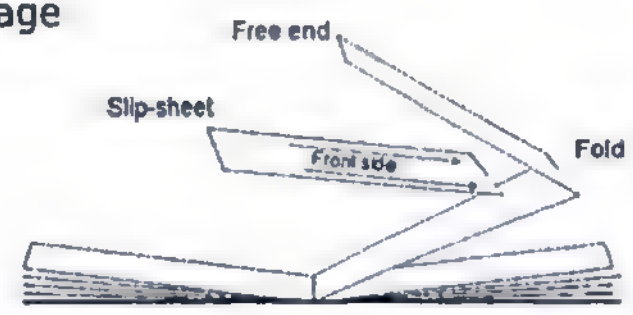


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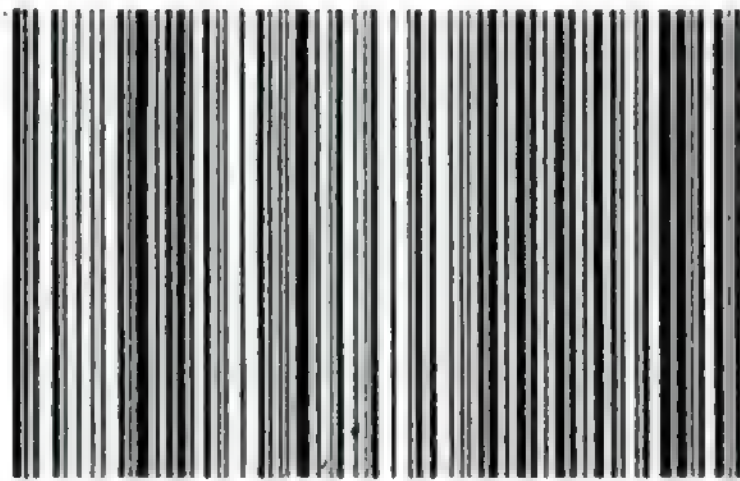
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3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lipBack-001B

Back

1. Follow instructions on the other side



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ABS DVD Deluxe Edition

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 16.7GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, Iomega Zip 250 Drive, 19" monitor. \$2,100 street. Whittier, CA; 800-876-8088; www.buyabs.com.

● The ABS DVD Deluxe Edition comes packed with peripherals at an attractive price. Ideal for demanding home users and PC enthusiasts, it's ready to work, whether you want to watch movies, play games, or burn CDs.

In our tested system, the capacious tower-style case was loaded with a DVD drive, a CD-RW drive, and a 250MB Iomega Zip Drive, plus a Creative Labs

site includes useful and usable content for buying and supporting PCs, although it lacks a troubleshooting wizard and online system documentation. Best for experienced users, the ABS system is a good deal.—*Bruce Brown*

ACT Brillianta DP 600

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 17GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 100 Drive, 17" monitor. \$1,800 street. City of Industry, CA; 800-775-1953; www.allcomp.com.

● The \$1,800 ACT Brillianta DP 600 isn't much to write home about. Our evaluation machine came with a fast hard disk and a 100MB Iomega Zip Drive, but it also had a relatively undistinguished CyberVision 17-inch monitor and a flimsy keyboard.

More annoying was the design of the crowded case interior, where a metal side shield prevented easy access to the system's two free front-accessible drive bays. Despite the presence of a Sigma Designs Real-Magic MPEG decoder, full-screen DVD playback often suffered from minor flecked interference. On our benchmark tests, the Brillianta performed on a par with other Pentium III/600 systems. The printed documentation was better than average.

The company's home page is confusing, and the online shopping experience gets worse as you delve down a page or two into the site. Documentation and support are nonexistent.—*Asa Somers*

American Multisystems InfoGold PIII Pro

Pentium III/600, 16MB ATI Xpert 128 graphics card, 17.6GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 250 Drive, 19" monitor. \$2,395 direct. Milpitas, CA; 800-888-6615; www.infogold.com.

● The American Multisystems InfoGold PIII Pro is competitively priced, but beyond the 600-MHz CPU and decent Impression 19-inch monitor, there isn't much for those enthusiasts out there to sink their teeth into.

The InfoGold inexplicably contains a basic ATI graphics adapter. Documentation is scanty: Several components lack any, and there is no overall system manual. Audio quality was good thanks to its speakers and the Creative Labs sound card, and the Yamaha speakers were among the best three-piece units in this roundup. On the whole, test performance was lackluster.

The company's Web site contains some useful material but is notable mainly for its many grammatical errors. No drivers, bug fixes, or documents are available online, nor is there true Web-based purchasing. All in all, the InfoGold PIII Pro lacks outstanding features. Look to systems from ABS and Micron in this roundup for better overall value.—*Jon A. Hill*

AST Premmia/PS Series

Pentium III/600, 16MB ATI Xpert 128 graphics card, 25GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 100 Drive, 17" monitor. \$1,880 street. Los Angeles; 877-278-2861; www.ast.com.

● The AST Premmia/PS Series is a reasonably priced and competent bundle for the small-business market. True power users will want to upgrade the graphics, but the model we tested is a good place to start.

A quick-start guide is included, along with a system manual. Case access was simple, revealing two available drive bays and two free PCI slots. No IRQs were free, however—another drawback for serious enthusiasts.

DVD and audio CD playback were fine, but it's easy to overwhelm the bundled two-piece Altec Lansing speakers. The Premmia/PS scored on a par with other systems on most of our benchmark tests. But the 16MB ATI Rage 128 graphics chip held back performance relative to the 32MB systems on other PCs.



The ABS DVD Deluxe Edition comes loaded—CD-RW and Zip Drives, big monitor, great speakers—for a reasonable price

Sound Blaster Live! audio board paired with powerful Altec Lansing speakers and subwoofer. The fine Optique 19-inch monitor was a nice bonus. Case access is simple: Just slide back the top and lift both side pieces. Even with the five drives installed, two 5.25-inch bays were available for future drive expansion. There were also four free PCI slots and one free IRQ. Unfortunately, documentation is limited to component booklets and disks.

Benchmark test performance was good across the board, and the unit turned in excellent scores on our ZD 3D Graphics WinMark suite. ABS's Web

Internet support is minimal now, but AST has big plans for later this year. Thanks to a recent partnership with Computer Associates, the company plans a wide range of services focused on small to medium-size business customers for late 1999, including support for Web hosting and e-commerce solutions. The Premia/PS remains an adequate but unexciting PC, which might suit its small-business audience just fine.—BB

Axis Orion 100V DVD, Terra AXG

Orion 100V: Pentium III/600, 32MB Matrox Millennium G400 graphics card, 21GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 19" monitor. \$2,655 direct.

Terra AXG: Athlon/600, 32MB Diamond Viper V770 Ultra graphics card, 21GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 19" monitor. \$2,695 direct. Anaheim, CA; 800-378-9014; www.axisystems.com

● Both PCs we reviewed from Axis Systems deliver plenty of bells and whistles in addition to solid processing brawn. Both came with removable drives, large and fast hard disks, network cards, gorgeous Sony MultiScan 420GS monitors, and elaborate five-piece Cambridge SoundWorks speakers. But at \$2,655 and \$2,695 direct, neither unit matches the bargain of a similarly configured Quantex or Dell system.

When it comes to ease of use, the Orion and Terra come oh-so-close. Both have easily opened and fairly spacious cases with six drive bays each. Decent user guides come loaded on disk, but neither guide supplies simple setup directions, and paper documentation is limited.

The Orion turned in above-average scores for PIII/600-based systems on all but our Winstone and CPUmark tests, where it performed about average. The Terra performed better, with outstanding scores across the board.

Subjectively, however, we felt that the Orion was the better medium for displaying video, providing extremely smooth playback and rich colors. The Athlon-based Terra, even as it outperformed its sibling on both raw speed and graphics-processing tests, suffered from rougher DVD performance. We also liked the Orion's dual-monitor support, provided by its Matrox Millennium G400 graphics card. Setting up this feature was a snap, and it provided an extra-wide venue for displaying large spreadsheets or several application windows at once.

Axis could use some help with its Web site. There is a custom configurator, but we found the online buying process quite disorganized. The site does offer live support chat during business hours and on weekends, but it does not provide any system docs, driver updates, or other basic support needs.—AS

BOLData Xtreme 4900XPR

Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, 16.7GB 7,200-rpm hard disk, 6X DVD-ROM drive, 19" monitor. \$2,000 street. Fremont, CA; 800-923-2653; www.boldata.com.

● The BOLData Xtreme 4900XPR is a competitively priced system with a rough edge or two. The system contains a mix of top-quality components—Matrox graphics card, Altec Lansing ACS45.1 speakers, Aureal Vortex sound card—and occasional missteps, such as its DVS DVD-ROM drive. But if you want lots of CPU cycles on a tight budget, BOLData's offering may fill the bill.

The Xtreme 4900XPR's case has a tool-free design that makes internal access easy, though we were surprised to see no system fan. Our tested unit had plenty of physical room for expansion but no available IRQs. The documentation is extremely sparse. Once the unit was up and running, however, its overall performance on our tests was average or better.

BOLData maintains a reasonable Internet presence, posting BIOS and driver updates in addition to product descriptions and general company information, but its site currently does not support credit card sales over the Web. To order, you have to pick up the phone.—JAH

Compaq Prosignia Desktop 330

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 32.6GB 7,200-rpm ATA-4 hard disk, 6X DVD drive, CD-RW drive, 10/100 Ethernet card, 19" monitor. \$2,700 street. Houston; 800-345-1518; www.compaq.com.

● Like many of its competitors in the direct PC market—Dell, Gateway, and Micron—Compaq has enhanced its power-user desktop with an almost excessive array of tools and services to facilitate system and Internet use. We've yet to see another mainstream PC with a 32GB hard disk, but the Compaq Prosignia Desktop 330's most compelling attributes involve its exterior design, its help tools, and the accompanying Internet-based services.

The Prosignia can be used either as a tower or as a flat-lying desktop. It's easy to set the system up, attach speakers and subwoofer, and add and remove cards or drives. The tested system lacked available external drive bays, but it did have two free IRQs and two free PCI slots. A third PCI slot was occupied not by a modem but by an Ethernet card (though modems are available). Performance was on a par with that of most other Pentium III/600 systems we tested, with especially noteworthy graphics performance from the nVidia RIVA TNT2 chip set.

Compaq supplies a wizard that quickly connects you to the company's ISP and supplies 100 free hours of access. All buyers also benefit from Compaq's Online Services, which let you back up files, create e-commerce sites, encrypt and send important documents, and purchase postage.





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The company also provides a recovery CD, a few diagnostic utilities, and software that lets Compaq technicians diagnose system problems remotely. At the Compaq.com Web site you can easily purchase a custom-built Prosignia and—if small problems arise—service the system yourself. With its many bundled tools, the Compaq Prosignia Desktop 330 should be on your short list.—CM

CyberMax Enthusiast PIII 600RM

Pentium III/600, 32MB Creative Labs 3D Sound Blaster TNT2 graphics card, 19.5GB 5,400-rpm hard disk, 6X DVD-ROM drive, 19" monitor. \$1,999 direct. Allentown, PA; 800-345-8939; www.cybmax.com.

● The CyberMax Enthusiast PIII 600RM is a solid offering if you're looking for a fast home-entertainment PC. Reasonable 3-D graphics performance, a full family-oriented software bundle, and

excellent Altec Lansing three-piece speakers with Dolby Pro Logic audio controls combine to make a compelling offering at the right price.

The Enthusiast's tower case has more useful interior room than most. The BIOStar motherboard provides an extra ISA slot, and, as shipped, the machine had one free IRQ. The star of this show, however, is the USB-based Altec Lansing

SUMMARY OF FEATURES

Fast PCs

	ABS DVD Deluxe Edition	ACT Brilliant DP 600	American Multisystems InfoGold PIII Pro	AST Premia/PS Series	Axis Orion 100V DVD	Axis Terra AXG	BOLData Xtreme 4300DP
■ YES □ NO							
Price of tested configuration	\$2,100 street	\$1,800 street	\$2,395 direct	\$1,880 street	\$2,655 direct	\$2,695 direct	\$2,000 street
Processor	Pentium III/600	Pentium III/600	Pentium III/600	Pentium III/600	Pentium III/600	AMD Athlon/600	Pentium III/600
Chip set	Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX	AMD 750	Intel 440BX
Motherboard	ABIT BE6SI	Super Micro Super P6SBA	ASUS P3B-F	Intel SE440BX-2	ASUS P3B-F	Micro-Star MS-6167	Diamond Microtronics C400
BIOS version or date	Award 4.51PG	AMI 2.0	Award 1.01	Phoenix 4.0	Award 4.51PG	Award 6.00PG	Award 4.51PG
Installed/maximum SDRAM	128MB / 768MB	128MB / 768MB	128MB / 1,024MB	128MB / 768MB	128MB / 768MB	128MB / 768MB	128MB / 768MB
Hard disks	1	1	1	1	1	1	1
Formatted capacity	16.7GB	16.7GB	17.6GB	25.5GB	21GB	21GB	16.7GB
Manufacturer and brand	IBM Deskstar	IBM Deskstar	Quantum Fireball	Seagate Baracuda	IBM Deskstar	IBM Deskstar	Western Digital Expert
Rotational speed (rpm)	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Interface	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE
Graphics card	Diamond Viper V770 Ultra	Diamond Viper V770 Ultra	ATI Xpert 128	ATI Xpert 128	Matrox Millennium G400	Diamond Viper V770 Ultra	Matrox Millennium G400 MAX
Graphics chip set	nVidia RIVA TNT2	nVidia RIVA TNT2	ATI Rage 128	ATI Rage 128	Matrox G400	nVidia RIVA TNT2	Matrox G400 MAX
Graphics memory	32MB SDRAM	32MB SGRAM	16MB SGRAM	16MB SGRAM	32MB SGRAM	32MB SDRAM	32MB SGRAM
MPEG-2 decoder	Power DVD (software)	Varies (hardware)	Toshiba (hardware)	ATI (hardware)	Zoran (software)	Diamond (software)	Matrox (hardware)
Monitor manufacturer	Optquest	CyberVision	Impression	AST	Sony	Sony	KDS
Screen size (diagonal, in inches)	19	17	19	17	19	19	19
DVD-ROM drive maker	Toshiba	Toshiba	Toshiba	Hitachi	Toshiba	Toshiba	DVS
DVD/CD transfer rates	6X / 32X	6X / 32X	6X / 32X	6X / 24X	6X / 32X	6X / 32X	6X / 32X
CD-RW drive in tested unit	Acer	N/A	N/A	N/A	HP	HP	N/A
Other mass-storage device in tested unit	Imaging Zip 250	Imaging Zip 100	Imaging Zip 250	Imaging Zip 100	Imaging Zip 100	Imaging Zip 100	None
Audio location	PCI local-bus card	PCI local-bus card	PCI local-bus card	Motherboard PCI	PCI local-bus card	PCI local-bus card	PCI local-bus card
Sound card	Creative Labs SB Live! Value	Creative Labs PCI 512	Creative Labs SB Live! Value	Yamaha DS-XG	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Aureal Vortex AU8830
Speakers in tested unit (number of pieces)	Altec Lansing ACS45.1 (3)	Acoustic Bass SBX-310 (3)	Yamaha YST-M15 (3)	Altec Lansing ACS43 (2)	Cambridge SoundWorks FPS2000 (5)	Cambridge SoundWorks FPS2000 (5)	Altec Lansing ACS45.1 (3)
Price of 10/100 Ethernet adapter	N/A	N/A	N/A	\$55	Included	Included	N/A
Modem/56K standard	Zoom 1120-02-15L/V 90	3Com/U.S. Robotics Voice Winmodem/V 90	3Com/U.S. Robotics Voice Winmodem/V 90	Lucent Winmodem/V 90	3Com/U.S. Robotics Voice Winmodem/V 90	3Com/U.S. Robotics Voice Winmodem/V 90	Lucent Winmodem/V 90
High-speed modem (price)	N/A	N/A	DSL (\$60)	N/A	N/A	N/A	N/A
Sales staff helps customers find high-speed service	□	□	■	□	□	□	□
Number of free IRQs	3	0	0	0	0	0	0
PCI/ISA/Shared expansion slots	4 / 1 / 1	3 / 2 / 1	4 / 1 / 1	3 / 1 / 1	4 / 1 / 1	4 / 1 / 1	4 / 1 / 1
Front-accessible drive bays (5.25" / 3.5")	4 / 2	3 / 2	3 / 2	3 / 2	3 / 2	4 / 2	3 / 2
Internal drive bays (5.25" / 3.5")	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 2
Power-supply wattage	250	235	235	200	250	250	250
Number of parallel/serial/mouse ports	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1
Number of USB/1394 ports	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0
Tool-free chassis	■	□	□	□	□	■	■
Keyboard supplier	Microsoft	Keytronic	Keytronic	NMB	Microsoft	Microsoft	Microsoft
Application/Web site launch keys	□ □	□ □	□ □	□ □	□ □	□ □	□ □
Volume/CD controls	□ □	□ □	□ □	□ □	□ □	□ □	□ □
Live technical support hours (eastern time)	24 hours, 7 days	11:30–8:00 M–F	11:00–9:00 M–F	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days
Standard warranty on parts/labor	3 years / lifetime	1 year / 1 year	1 year / 3 years	3 years / 1 year	3 years / 3 years	3 years / 3 years	3 years / 3 years
On-site service charge for 1 year	\$99	\$199	\$99	Included	N/A	N/A	Included

N/A—Not applicable. The product does not have this feature.

audio system. The USB connection, in combination with Altec Lansing's Pro Logic audio management software, lets you adjust each speaker component independently via the mouse or keyboard.

The Enthusiast performed fairly well on our benchmark tests despite its 5,400-rpm hard disk (most others in this roundup had 7,200-rpm models). CyberMax maintains a full-fledged Internet

presence, providing driver updates, bug fixes, and troubleshooting wizards on its Web site as well as secure online credit card sales. Overall, this is a reasonable choice for savvy home enthusiasts.—JAH

Dell Dimension XPS T600

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 25.5GB 7,200-rpm hard disk, 8X DVD-ROM drive, CD-RW drive, 19" monitor. \$2,809 direct. Round Rock, TX; 800-388-8542; www.dell.com.



Few machines, if any, are more complete than the Dell Dimension XPS T600. Dell augments the system's fine hardware core with a potent set of help tools, a year of free Internet access, and a keyboard equipped with audio and Internet controls. It is a wonderfully effective machine, and it wins our Editors' Choice.

See www.pcmag.com for interactive views.



Continues

Compaq Prosignia Desktop 330	CyberMax Enthusiast PIII 600RM	Dell Dimension XPS T600	DTK APRI-80M/PIII600	Falcon Northwest Mach V	Future Power Series FP-7B500	Gateway Performance 550	Hertz P550i
\$2,700 street	\$1,999 direct	\$2,809 direct	\$2,950 street	\$3,499 direct	\$1,900 street	\$2,362 direct	\$2,395 direct
Pentium III/600	Pentium III/600	Pentium III/600	Pentium III/600	AMD Athlon/700	Pentium III/550	Pentium III/550	Pentium III/550
Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX	AMD 750	Intel 440BX	Intel 440BX	Intel 440BX
Compaq	Biostar M6TBA	Intel Seattle III	DTK PRM-0080i	ASUS K7M	ABIT BE6	Intel Tabor III	Intel SE440BX
Compaq 7/2/99	Award 4.51PG	Phoenix 4.0	Award 4.51PG	Award 4.51PG	Award 4.51PG	AMI 2.0	Phoenix 4.0
128MB / 384MB	128MB / 384MB	128MB / 768MB	128MB / 1,024MB	128MB / 768MB	128MB / 768MB	128MB / 384MB	128MB / 768MB
1	1	1	1	1	1	1	2
31.9GB	19GB	25.5GB	16.7GB	21GB	19.1GB	19.1GB	16.7GB
IBM Deskstar	Western Digital Caviar	IBM Deskstar	IBM Deskstar	IBM Deskstar	Western Digital Caviar	Quantum Fireball Plus	IBM Deskstar
7,200	5,400	7,200	7,200	7,200	5,400	7,200	7,200
Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE
Diamond Viper V770 Ultra	Creative Labs 3D Blaster TNT2	Diamond Viper V770 Ultra	Matrox Millennium G400 MAX	Guillemot Maxi Gamer Xentor SE	Diamond Stealth III S540	Creative Labs 3D Blaster TNT2 Pro	3dfx Voodoo 3 2000
nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	Matrox G400 MAX	nVidia RIVA TNT2 Ultra	S3 Savage4	nVidia RIVA TNT2	3Dfx Voodoo3
32MB SDRAM	32MB SDRAM	32MB SDRAM	32MB SGRAM	32MB SGRAM	32MB SDRAM	32MB SGRAM	16MB SGRAM
Divicare (software)	Quadrant (software)	Quadrant (software)	Sigma (hardware)	Sigma (hardware)	S3 (hardware)	Quadrant (software)	Win DVD (software)
Compaq	CyberMax	Dell	DTK	ViewSonic	Future Power	Gateway	Sampo
19	19	19	15 (LCD)	21	19	19	17
Pioneer	Toshiba	Hitachi	Sony	Toshiba	Toshiba	Toshiba	Toshiba
6X / 32X	6X / 32X	8X / 40X	6X / 32X	6X / 32X	6X / 32X	6X / 32X	6X / 32X
Sony	N/A	Sony	Sony	N/A	N/A	Philips	N/A
None	None	Imaging Zip 100	None	Imaging Zip 100	NEC SuperDisk (120MB)	None	Imaging Zip 100
PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	Motherboard PCI
Creative Labs SB Live! Value	Aureal Vortex AU8830	Creative Labs SB Live! Value	Creative Labs CT 4832	Diamond Monster Sound MX300	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Yamaha DS-XG XMF740
Altec Lansing ACS233 (2)	Altec Lansing ADA305W (3)	Altec Lansing ACS340 (3)	Juster Multimedia SP-628 (3)	Cambridge SoundWorks DTT2500 (5)	Altec Lansing ACS21W (2)	Boston Acoustics BA735 (2)	Multimedia Speakers IC693 (2)
Included	\$35	\$49	Included	Included	\$45	Included	Included
N/A	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	N/A	N/A	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	N/A
N/A	N/A	G.Lite DSL (\$79)	N/A	ISDN, cable, DSL (varies)	N/A	N/A	N/A
□	□	■	■	■	□	■	■
2	1	2	0	1	0	1	0
3 / 1 / 1	3 / 2 / 1	4 / 0 / 1	3 / 2 / 1	3 / 2 / 1	4 / 1 / 1	4 / 0 / 1	3 / 1 / 1
2 / 1	4 / 2	2 / 3	3 / 2	3 / 2	3 / 2	3 / 2	3 / 3
0 / 2	0 / 3	0 / 2	0 / 1	0 / 3	2 / 2	0 / 3	0 / 0
145	235	200	300	300	230	200	235
1 / 2 / 1	1 / 2 / 1	1 / 1 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1
2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0
■	□	■	□	■	■	■	■
Compaq	Microsoft	Dell/Microsoft	Microsoft	Microsoft	Future Power	Gateway	BTC
□ ■	□ □	□ ■	□ □	■ □	■ ■	■ ■	■ □
□ □	□ □	■ ■	□ □	□ □	■ ■	■ ■	□ □
24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	8:30–5:30 M–F (in all time zones)	11:00–11:00 M–F	11:30–9:00 M–F	24 hours, 7 days	24 hours, 7 days
3 years / 1 year	3 years / 1 year	3 years / 1 year	2 years / 2 years	1 year / 1 year	1 year / 1 year	3 years / 3 years	3 years / 3 years
Included	Included	Included	\$50	N/A	\$59	Included	\$295

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XG9 Features

- Modular design with hot-swappable multi-bay for DVD-ROM drive, CD-RW drive, additional hard drive, floppy drive or additional battery
- Intel Pentium III processor 500 MHz¹
- 18.1 GB² fixed hard drive
- 6 lbs.,³ 1.75" thin
- 128 MB SDRAM (expandable to 256 MB max.)
- 13.3" XGA TFT screen
- 4X max. DVD-ROM drive
- Sony original programmable jog dial for quick access to programs or files
- High-capacity Lithium-Ion Battery, with dual battery capability
- i.LINK® (IEEE-1394) interface for DV editing and data transfer between computers
- Integrated V.90/56K modem⁴
- 256-bit graphics chip
- Built-in stereo speakers
- Digital touch pad
- Microsoft® Windows® 98 second edition

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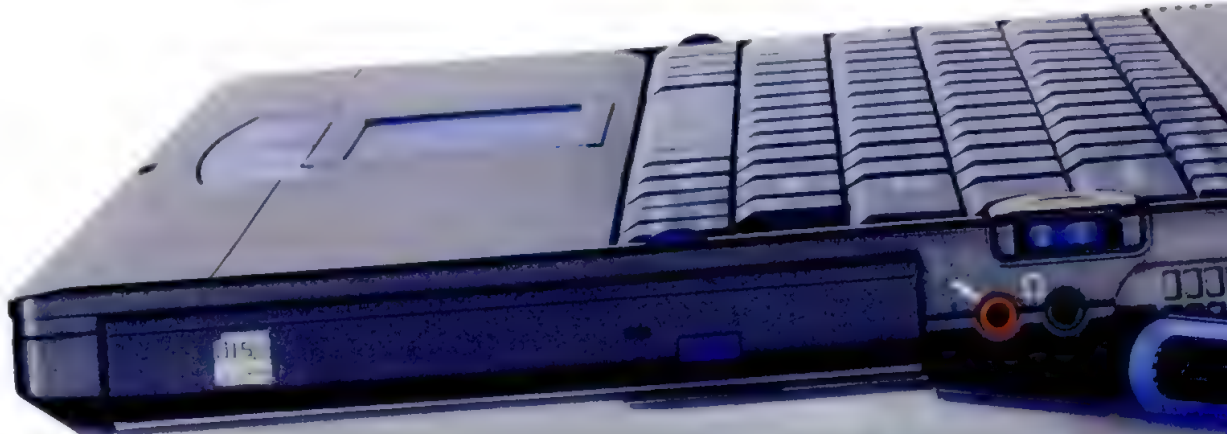
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- Upgrade to 192 MB RAM ADD \$150.00

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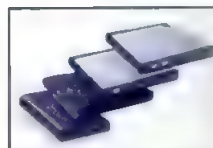
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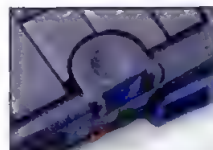
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SONY

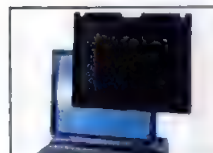
VAIO



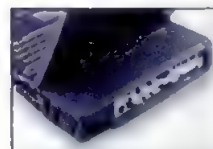
The hot-swappable multi-bay is perfect for DVDs, floppies and an optional CD-RW, a second hard drive and extra battery capabilities.



The convenient jog dial offers easy customized access to the files and programs you use the most.



Swap the standard screen for an optional privacy screen with a 48° field of view to shield confidential documents from strangers.



An optional multimedia docking station offers full port replication, digital optical out, Control A1, NTSC video out, additional type III PC Card slot and much more.

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The Dimension is easily set up, and performance was average or above average on our benchmark tests. Dell's added value comes in its software and services. The custom Internet wizard cleanly connects you to the company's ISP, Dell.net, and affords a year of free Internet access (up to 150 hours per month), while a SnapRestore utility lets you periodically save your hard disk image and restore

an old image if problems arise.

Like all Dell PCs, this Dimension is preloaded with an Express Service Code that, when keyed into the Dell Web site, accesses a database of drivers, bug fixes, and other help tools specific to the system's hardware. Using the company's FileWatch service, you can be notified via e-mail when new files are added to the database.

Audio performance was impressive, thanks to a Creative Labs Sound Blaster Live! Value audio card and an Altec Lansing three-piece speaker system. The Sony CD-RW drive performed flawlessly as well.

Famously, Dell lets you quickly custom-configure and purchase machines online. The company's Web site, like the Dell Dimension XPS T600, has been care-

SUMMARY OF FEATURES

Fast PCs

	HP Pavilion 8500 Series	Highwave PPH550	HiQ Impact 2000 Plus-600	IBM Aptiva S-Series 865	Kingdom Pinnacle 600S	Maximus Power Max 550	MaxTech MXA600S
■ YES □ NO							
Price of tested configuration	\$3,209 street	\$2,295 direct	\$1,999 direct	\$3,750 street	\$3,497 direct	\$1,999 direct	\$2,800 street
Processor	Pentium III/600	Pentium III/550	Pentium III/600	AMD Athlon/650	Pentium III/600	Pentium III/550	AMD Athlon/600
Chip set	Intel 440BX	Intel 440BX	Intel 440BX	AMD 750	Intel 440BX	Intel 440BX	AMD 750
Motherboard	Asus Condor 1	Intel Seattle II	Asus P2B-F	Acer C5	Super Micro Super P6DBU	BCM QS440BX	BCM QS750
BIOS version or date	Phoenix 4.0	Phoenix 4.0	Award 4.51PG	AMI 2.0	AMI 2.0	Award 4.51PG	Award 6.00PG
Installed/maximum SDRAM	128MB / 256MB	128MB / 768MB	128MB / 1,024MB	128MB / 384MB	128MB / 1,024MB	128MB / 384MB	128MB / 768MB
Hard disks	1	1	1	1	1	1	1
Formatted capacity	19.1GB	16.7GB	16.7GB	19.1GB	17GB	16.7GB	16.7GB
Manufacturer and brand	Maxtor Diamond Max Plus	IBM Deskstar	Western Digital Expert	Maxtor Diamond Max Plus	Seagate Barracuda	IBM Deskstar	IBM Deskstar
Rotational speed (rpm)	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Interface	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Ultra-2 SCSI	Enhanced IDE	Enhanced IDE
Graphics card	ASUS AGP-V3800 TNT2 Ultra	Matrox Millennium G400	Matrox Millennium G400 Max	Elsa Erazor III TNT2 Ultra	ATI Xpert 128	Matrox Millennium G400	3dfx Voodoo 3 3500
Graphics chip set	nVidia RIVA TNT2	Matrox G400	Matrox G400	nVidia RIVA TNT2	ATI Rage 128	Matrox G400	3Dfx Voodoo3
Graphics memory	32MB SDRAM	32MB SGRAM	32MB SGRAM	32MB SGRAM	32MB SGRAM	32MB SGRAM	16MB SGRAM
MPEG-2 decoder	Quadrant (software)	Sigma (hardware)	Matrox (hardware)	DVD Express (software)	ATI (hardware)	Zoran (software)	Win DVD (software)
Monitor manufacturer	HP	ViewSonic	Iiyama	IBM	ADI	CyberVision	MaxTech
Screen size (diagonal, in inches)	15 (LCD)	19	17	15 (LCD)	15 (LCD)	19	15 (LCD)
DVD-ROM drive maker	Hitachi	Toshiba	Toshiba	Hitachi	DVS	Samsung	Toshiba
DVD/CD transfer rates	6X / 24X	6X / 32X	6X / 32X	8X / 40X	6X / 32X	5X / 32X	4X / 32X
CD-RW drive in tested unit	HP	N/A	N/A	N/A	N/A	N/A	N/A
Other mass-storage device in tested unit	Iomega Zip 100	Iomega Zip 250	Mitsubishi SuperDisk (120MB)	None	Iomega Zip 250	None	SuperDisk (120MB)
Audio location	PCI local-bus card	Motherboard PCI	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card
Sound card	Aureal Vortex AU8830	Yamaha YMF-740	Turtle Beach Montego II Guadzilla	Aureal Vortex AU8830	Creative/Ensonic CT 4810	Creative Labs SB Live! Value	Creative Labs SB Live! Value
Speakers in tested unit (number of pieces)	Polk Audio AMR2 (2)	Yamaha YST-M7 (2)	Cambridge Sound-Works PCWorks (3)	Infinity (2)	Cambridge Sound-Works PCWorks (3)	Labtech LCS 2632 (3)	Altec Lansing ACS33 (3)
Price of 10/100 Ethernet adapter	Included	N/A	Included	\$83	Included	N/A	Included
Modem/56K standard	Lucent Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	N/A	GVC PCI 56K Data/Fax/V.90	N/A	Motorola SM56/V.90	Maxtech XPV56P/V.90
High-speed modem (price)	N/A	N/A	DSL (\$225)	N/A	N/A	N/A	N/A
Sales staff helps customers find high-speed service	□	□	■	■	□	□	□
Number of free IRQs	1	0	1		2	2	2
PCI/ISA/Shared expansion slots	4/1/0	3/1/1	4/1/1	5/0/0	4/1/1	4/1/1	3/2/1
Front-accessible drive bays (5.25" / 3.5")	3/1	3/2	2/2	3/1	3/1	3/1	3/1
Internal drive bays (5.25" / 3.5")	0/0	0/0	3/1	0/1	0/2	0/1	0/2
Power-supply wattage	160	230	125	200	235	300	200
Number of parallel/serial/mouse ports	1/3/1	2/2/1	1/2/1	1/2/1	1/2/1	1/2/1	1/2/1
Number of USB/1394 ports	2/0	2/0	2/0	3/0	2/0	2/0	2/0
Tool-free chassis	■	□	□	■	□	□	□
Keyboard supplier	HP	Keytronic	Keytronic	IBM	Microsoft	Logitech	Keytronic
Application/Web site launch keys	■ ■	□ □	□ □	□ □	□ □	□ □	□ □
Volume/CD controls	■ ■	□ □	□ □	□ □	□ □	□ □	□ □
Live technical-support hours (eastern time)	24 hours, 7 days	Noon-9:00 M-F	8:00-5:00 M-F	24 hours, 7 days	8:30a-9:00p M-F, 8:00-8:00 Sat.	Noon-9:00 M-F, 1:00p-7:00p Sat.	Noon-9:00 M-F
Standard warranty on parts/labor	1 year / 1 year	1 year / 3 years	3 years / 3 years	1 year / 1 year	3 years / 1 year	3 years / 1 year	3 years / 3 years
On-site service charge for 1 year	N/A	\$109.95	\$49	\$99	Included	\$59	N/A

N/A—Not applicable. The product does not have this feature.

fully crafted to make things easier for the end user.—*CM*

DTK APRI-80M/PIII600

Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, 17.2GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 15" LCD monitor. \$2,950 street. City of Industry, CA; 626-810-0098; www.dtkcomputer.com.

● The DTK APRI-80M/PIII600 is a well-designed offering that deserves serious

consideration. Professional touches—such as the 15-inch DTK flat-panel display, the Promise UDMA/66 hard disk controller, and the Sony Spresra CD-RW drive—combine with above-average performance in this business-oriented competitor.

Our tested unit came loaded. The unit's fast IBM hard disk, UDMA/66 controller, and Matrox graphics card

combined to produce fine performance, yielding above-average scores on nearly all our tests.

DTK's products are widely available through reseller channels. The company does not sell directly over the Internet but does provide BIOS updates and system manuals via the Web. In view of all that's included, this performance-oriented machine is worth a look.—*JAH*

See www.pcmag.com for interactive views.

Continues

MaxTech MXP600S	Mega Impact PIII	Micro Express MicroFlex-72A	Micron Millennia Max PIII 600	NexTrend NexStar-Pro	NexTrend NexStar-2000	PC Connection Epic BPS 8000	Polywell Poly 800B9
\$2,800 street	\$1,950 street	\$1,599 direct	\$1,932 direct	\$3,219 direct	\$3,399 direct	\$1,700 street	\$2,500 street
Pentium III/600	Pentium III/600	AMD Athlon/600	Pentium III/600	Pentium III/600	AMD Athlon/600	Pentium III/550	Pentium III/600
VIA	Intel 440BX	AMD 750	Intel 440BX	Intel 440BX	AMD	Intel 440BX	Intel 440BX
BCM GT693VA	ABIT M3BE6	Micro-Star MS-6167	Intel Seattle II	Micro-Star MS-6119	Micro-Star MS-6167	Biostar M6TBA	Promise Technology FT 440BX
Award 6.00PG	Award 4 51PG	Award 6.00PG	Phoenix 4.0	Award 4.51PG	Award 6.00PG	Award 4.51PG	Award 4 51PG
128MB / 256MB	128MB / 768MB	128MB / 768MB	128MB / 768MB	128MB / 768MB	128MB / 768MB	128MB / 384MB	128MB / 1,024MB
1	1	1	1	1	1	1	2
16.7GB	19.1GB	16.7GB	19.1GB	17GB	17GB	19GB	23.3GB
IBM Deskstar	Seagate Barracuda	Western Digital Expert	IBM Deskstar	IBM Ultrastar	IBM Ultrastar	Western Digital Caviar	IBM Deskstar
7,200	7,200	7,200	7,200	10,000	10,000	5,400	7,200
Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Ultra-2 SCSI	Ultra-2 SCSI	Enhanced IDE	Enhanced IDE
3dfx Voodoo 3 3500	Matrox Millennium G400 MAX	ATI Rage 128	Diamond Viper V770 Ultra	Diamond Viper V770 Ultra	Diamond Viper V770 Ultra	3dfx Voodoo 3 2000	Matrox Millennium G400 MAX
3Dfx Voodoo3	Matrox G400 MAX	ATI Rage Fury 128	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	3Dfx Voodoo3	Matrox G400 MAX
16MB SGRAM	32MB SDRAM	32MB SDRAM	32MB SGRAM	32MB SDRAM	32MB SDRAM	16MB SGRAM	32MB SGRAM
Win DVD (software)	Matrox (hardware)	ATI (hardware)	InterVideo (software)	Zoran (software)	Xing (software)	Quadrant (software)	Matrox (hardware)
MaxTech	MGC	Impression	Micron	CyberVision	CTX	Pionex	PlusOne DecaView
15 (LCD)	17	17	19	19	19	17	19
Toshiba	Toshiba	Toshiba	NEC	AOpen	Toshiba	Toshiba	Toshiba
4X / 32X	6X / 32X	6X / 32X	8X / 40X	6X / 32X	4X / 32X	6X / 32X	6X / 32X
N/A	N/A	N/A	N/A	N/A	N/A	N/A	Ricoh
SuperDisk (120MB)	Imomega Zip 100	None	None	Imomega Zip 250	Imomega Zip 250	None	Imomega Zip 100
Motherboard PCI	PCI local-bus card	PCI local-bus card	Motherboard PCI	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card
Creative Labs ES1373	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Yamaha DS-XG	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Aureal Vortex AU8330	Aztec 7800 V USR
Altec Lansing ACS33 (3)	Cambridge SoundWorks PCWorks (3)	Powerful Sub Sys SW 780 (3)	Cambridge SoundWorks DTT2500 (5)	Altec Lansing ADA305 (3)	Altec Lansing ACS45.1 (3)	Altec Lansing ACS90 (2)	Altec Lansing ACS45.1 (3)
Included	\$50	N/A	\$52	\$50	\$50	Included	Included
Maxtech XPV56P/V.90	N/A	Apache K56 Internal/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	N/A	Lucent Winmodem/K56
N/A	Cable, DSL (varies)	N/A	N/A	N/A	N/A	N/A	DSL (\$150)
□	■	□	■	□	□	■	■
1	0	0	1	0	0	1	1
2 / 0 / 1	4 / 1 / 1	4 / 1 / 1	3 / 1 / 1	3 / 2 / 1	3 / 1 / 1	3 / 2 / 1	3 / 2 / 1
2 / 2	3 / 2	4 / 2	3 / 2	3 / 2	3 / 2	4 / 1	2 / 2
0 / 0	0 / 1	0 / 1	0 / 4	0 / 2	0 / 2	0 / 4	0 / 3
150	250	300	250	235	300	250	250
1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1
2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0
□	□	□	■	■	□	□	■
Keytronic	NMB	Keytronic	Micron	Microsoft	Microsoft	Microsoft	Keytronic
□□	□□	□□	■ ■	□□	□□	□ ■	□□
□□	□□	□□	■ ■	□□	□□	■ ■	□□
Noon-9:00 M-F	11:00-8:00 M-F	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	11:30-9:30 M-F
3 years / 3 years	2 years / 2 years	4 years / 4 years	3 years / 3 years	3 years / 3 years	3 years / 3 years	1 year / 1 year	3 years / 5 years
N/A	\$75	\$50	Included	Included	Included	N/A	\$75



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Falcon Northwest Mach V

Athlon/700, 32MB Guillemot Maxi Gamer Xentor SE graphics card, 21GB 7,200-rpm hard disk, 6X DVD drive, Iomega Zip 100 drive, 21" monitor. \$3,499 direct. Ashland, OR; 888-325-2661; www.falcon-nw.com.

● This extravagant gaming machine from Falcon Northwest Computer Systems may lack the help tools and support options of the market's leading power-

user PCs, but its audio, graphics, and DVD subsystems are brilliantly effective.

Falcon doesn't offer a user manual, on-disk documentation, or much support software. But a Toshiba DVD drive and a Sigma MPEG decoder card afford near-flawless video playback, while a Diamond Monster sound card and a five-piece Cambridge SoundWorks Digital Theater speaker set provide impressive audio.

Falcon includes a 21-inch ViewSonic monitor, a Reflex3D joystick, an optical mouse, and a special Guillemot graphics card based on the nVidia's RIVA TNT2 Ultra chip. The Mach V produced the highest scores on our 3D Graphics WinMark and Business Graphics WinMark tests.

You can't use Falcon's Web site to configure or purchase a machine, but Falcon plans to add such support by year end.

SUMMARY OF FEATURES

Fast PCs

	Polywell Poly 800K7-600	Premio Apollo BX 600	Quantex SM600 SE	Racer PM600I	Royal Power Desktop	SAG STA-DPOYIII-VWK	Sony VAIO PCV-R539DS
■ YES □ NO							
Price of tested configuration	\$2,200 street	\$2,300 street	\$2,299 direct	\$2,500 street	\$1,649 direct	\$2,400 direct	\$2,350 street
Processor	AMD Athlon/600	Pentium III/600	Pentium III/600	Pentium III/600	Pentium III/550	Pentium III/600	Pentium III/550
Chip set	AMD 750	Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX	Intel 440BX
Motherboard	Micro-Star MS-6167	Micro-Star MS-6116	BioStar M6TBA	Intel SE440BX-2	Gainward GW6IBA	SuperMicro Super P6DBE	ABIT BH6
BIOS version or date	Award 6.00PG	Award 4.51PG	Award 4.51PG	Phoenix 4.0	Award 4.51PG	AMI 2.5	Award 4.51PG
Installed/maximum SDRAM	128MB / 768MB	128MB / 256MB	128MB / 384MB	128MB / 768MB	128MB / 768MB	128MB / 512MB	128MB / 256MB
Hard disks	2	1	1	1	1	1	1
Formatted capacity	26.9GB	17.1GB	16.7GB	19.1GB	16.8GB	19.1GB	25.5GB
Manufacturer and brand	IBM Deskstar	Quantum Atlas	Western Digital Expert	Maxtor	Western Digital Expert	IBM Deskstar	Seagate Barracuda
Rotational speed (rpm)	7,200	7,200	7,200	7,200	7,200	7,200	7,200
Interface	Enhanced IDE	Ultra-2 SCSI	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE
Graphics card	Diamond Viper V770 Ultra	Diamond Viper V770 Ultra	Creative Labs 3D Blaster TNT2	Diamond Viper V770 Ultra	Leadtek S320 II-Ultra	Matrox Millennium G400 MAX	ATI Rage 128GL
Graphics chip set	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	Matrox G400 MAX	ATI Rage 128
Graphics memory	32MB SGRAM	32MB SDRAM	32MB SDRAM	32MB SDRAM	32MB SGRAM	32MB SGRAM	32MB SDRAM
MPEG-2 decoder	Power DVD (software)	Diamond (software)	Quadrant (software)	Zoran (software)	Power DVD (software)	Sigma (hardware)	ATI (hardware)
Monitor manufacturer	PlusOne DecaView	Premio	Quantex	Racer	CyberVision	Hitachi	Sony
Screen size (diagonal, in inches)	19	19	19	19	19	19	17
DVD-ROM drive maker	Toshiba	Creative Labs	Toshiba	Hitachi	Pioneer	Sony	Pioneer
DVD/CD transfer rates	4X / 32X	5X / 32X	6X / 32X	6X / 24X	6X / 32X	6X / 32X	8X / 40X
CD-RW drive in tested unit	N/A	N/A	Philips	N/A	N/A	Sony	Sony
Other mass-storage device in tested unit	Iomega Zip 100	None	None	None	Iomega Zip 100	SuperDisk (120MB)	None
Audio location	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card
Sound card	Yamaha Waveforce	Creative Labs SB Live! Value	Aureal Vortex AU8330	Diamond Monster Sound MDC300	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Aureal Vortex AU8330
Speakers in tested unit (number of pieces)	Altec Lansing ACS45.1 (3)	Premio 636 (3)	Altec Lansing ADA305W (3)	Altec Lansing ACS48W (3)	Altec Lansing ACS54 (5)	Benwin BWS30-3D (4)	Sony SrS-Z050V (2)
Price of 10/100 Ethernet adapter	\$20	Included	N/A	\$59	N/A	Included	N/A
Modem/56K standard	Lucent Winmodem/56K	N/A	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Winmodem/V.90	Lucent Winmodem/V.90	N/A	Lucent Winmodem/V.90
High-speed modem (price)	DSL (\$150)	N/A	N/A	N/A	N/A	N/A	N/A
Sales staff helps customers find high-speed service	■	□	□	□	□	□	□
Number of free IRQs	0	1	1	1	1	0	1
PCI/ISA/Shared expansion slots	4 / 1 / 0	3 / 2 / 1	3 / 2 / 1	3 / 1 / 1	3 / 2 / 1	4 / 1 / 1	3 / 0 / 0
Front-accessible drive bays (5.25" / 3.5")	2 / 2	3 / 2	2 / 1	0 / 1	3 / 1	3 / 1	2 / 1
Internal drive bays (5.25" / 3.5")	0 / 3	0 / 3	0 / 2	3 / 3	0 / 1	0 / 2	2 / 2
Power-supply wattage	230	200	115	115	230	250	200
Number of parallel/serial/mouse ports	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 2 / 1	1 / 1 / 1
Number of USB/1394 ports	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 0	2 / 2
Tool-free chassis	■	□	□	■	□	□	□
Keyboard supplier	Keytronic	Mitsumi	Microsoft	Microsoft	Win Best	SAG	Sony
Application/Web site launch keys	□□	□□	■□	□□	□□	□□	■□
Volume/CD controls	□□	□□	□□	□□	□□	□□	□□
Live technical-support hours (eastern time)	11:30-9:30 M-F	10:00-9:00 M-F	24 hours, 7 days	24 hours, 7 days	11:00-9:00 M-F, noon-7:00 Sat.	9:00-9:00 M-F	24 hours, 7 days
Standard warranty on parts/labor	3 years / 5 years	3 years / 3 years	3 years / 1 year	3 years / 3 years	3 years / 1 year	3 years / 3 years	1 year / 1 year
On-site service charge for 1 year	\$75	Included	N/A	Included	\$129.95	Included	Included

N/A—Not applicable: The product does not have this feature.

For the ultimate game machine, the Mach V is a good choice.—*CM*

Future Power Series FP-7B50D

Pentium III/550, 32MB Diamond Stealth III S540 graphics card, 19.1GB 5,400-rpm hard disk, 6X DVD-ROM drive, 120MB SuperDisk drive, 19" monitor. \$1,900 street. Santa Clara, CA; 888-818-4776; www.futurepowerusa.com.

● Sold via resellers, the Future Power Series FP-7B50D is intended as a value-

priced choice for users who don't need the fastest components. Its performance lagged most others in this roundup, and we found units (from ABS, BOLDdata, and Micron) that delivered markedly better speed for about the same money.

One noteworthy feature is the NewQ Gold audio control system with SRS 3-D sound enhancement and a seven-band graphic equalizer built into a 5.25-inch

drive bay slot. Documentation consisted largely of separate component booklets. On our benchmark tests, the FP-7B50D trailed the field of 550-MHz Pentium IIIs.

The Web site offers driver and BIOS updates but has no troubleshooting wizard. An underperformer for its price, the FP-7B50D may be more attractive if you can negotiate a lower price from a reseller.—*BB*

See www.pcmag.com for interactive views.

Ends

SYS Performance 600A	SYS Performance 600P3	Systemax PVO-T600	Tangent Medallion	TigerDirect K-Series Extreme	Wintec Ultimate Edge	Wintec Ultimate Edge/A	Xi 600 MTower XP
\$3,000 street	\$3,000 street	\$2,250 street	\$1,695 direct	\$2,749 direct	\$3,175 direct	\$3,275 direct	\$1,699 direct
AMD Athlon/600	Pentium III/600	Pentium III/600	Pentium III/600	AMD Athlon/600	Pentium III/600	AMD Athlon/650	Pentium III/600
AMD 750	Intel 440BX	Intel 440BX	Intel 440BX	AMD 750	Intel 440BX	AMD 750	Intel 440BX
Micro-Star MS-6167	Soyo SY-68A+III	Intel SE440BX	Micro-Star MS-6163	BioStar MS-6167	Intel SE440BX	Micro-Star MS-6167	Super Micro Super P6SBA
Award 6.00PG	Award 4.51PG	Phoenix 4.0	Award 4.51PG	Award 6.00PG	Award 4.51PG	Award 6.00PG	AMI 2.1
128MB / 768MB	128MB / 1,024MB	128MB / 1,024MB	128MB / 768MB	128MB / 768MB	128MB / 512MB	128MB / 384MB	128MB / 384MB
2	2	1	1	1	1	1	1
17GB	17GB	25.5GB	21GB	17.1GB	17.1GB	17.1GB	21GB
IBM Deskstar	IBM Deskstar	Quantum Fireball Plus	IBM Deskstar	Quantum Fireball Plus	Quantum Atlas	Quantum Atlas	IBM Deskstar
7,200	7,200	7,200	7,200	7,200	10,000	10,000	7,200
Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Enhanced IDE	Ultra SCSI	Ultra SCSI	Enhanced IDE
Matrox Millennium G400 MAX	Diamond Viper V770 Ultra	Creative Labs 3D Blaster TNT2	Diamond Viper V770 Ultra	Diamond Viper V770 Ultra	Matrox Millennium G400	Matrox Millennium G400	Matrox Millennium G400 Max
Matrox G400 MAX	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	nVidia RIVA TNT2	Matrox G400	Matrox G400	Matrox G400
32MB SGRAM	32MB SGRAM	32MB SGRAM	32MB SDRAM	32MB SDRAM	32MB SGRAM	32MB SGRAM	32MB SGRAM
Creative Labs (hardware)	Creative Labs (hardware)	Creative Soft (software)	Zoran (software)	CyberLink (software)	Matrox (hardware)	Matrox (hardware)	Matrox (hardware)
KDS	KDS	AOC	CTX	ViewSonic	ViewSonic	ViewSonic	Optique
19	19	17	19	19	17	17	17
Creative Labs	Creative Labs	Pioneer	Toshiba	Matshita	Toshiba	Toshiba	Toshiba
6X / 24X	6X / 24X	6X / 32X	4X / 32X	5X / 32X	6X / 32X	6X / 32X	6X / 32X
Yamaha	Yamaha	Creative Labs	HP	N/A	N/A	N/A	N/A
None	None	None	Imomega Zip 250	Imomega Zip 250	Castlewood Orb 2	Castlewood Orb 2	None
PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card	PCI local-bus card
Creative Labs SB Live! Value	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Creative Labs SB Live! Gold	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Creative Labs SB Live! Value	Creative Labs SB Live! Value
Altec Lansing ACS54 (5)	Altec Lansing ACS54 (5)	Altec Lansing ADA305 (3)	Altec Lansing ACS45.1 (3)	Altec Lansing ADA305W (3)	Altec Lansing ACS45.1 (3)	Altec Lansing ACS45.1 (3)	Altec Lansing ADA305W (3)
Included	Included	\$23	Included	N/A	\$25	\$25	N/A
N/A	N/A	3Com/U.S. Robotics Winmodem/V.90	N/A	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	3Com/U.S. Robotics Voice Winmodem/V.90	TAICOM MR56PVS-Hi/V.90
N/A	N/A	DSL (\$56)	N/A	N/A	N/A	N/A	N/A
□	□	□	■	■	□	□	■
0	0	1	4	1	0	0	0
4/1/1	4/1/1	3/1/1	4/2/1	4/1/1	3/1/1	4/1/1	3/2/1
3/2	3/2	3/2	2/1	3/2	3/2	3/2	3/2
0/3	0/3	0/2	2/2	0/1	0/1	0/1	0/3
300	300	200	250	150	230	230	115
1/2/1	1/2/1	1/2/1	1/2/1	1/2/1	1/2/1	1/2/1	1/2/1
2/0	2/0	2/0	2/0	2/0	2/0	2/0	2/0
□	□	■	□	□	□	□	□
SYS	SYS	NMB	Acer	PC Concepts	Microsoft	Microsoft	Keytronic
□□	□□	□□	□□	□□	□□	□□	■□
□□	□□	□□	□□	□□	□□	□□	□□
24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	11:00-8:00 M-F	11:00-8:00 M-F	24 hours, 7 days
3 years / 5 years	3 years / 5 years	3 years / 3 years	3 years / 3 years	3 years / 3 years	1 year / 1 year	3 years / 3 years	3 years / 3 years
Included	Included	N/A	Included	N/A	\$49	\$49	Included

Gateway Performance 550

Pentium III/550, 32MB Creative Labs 3D Sound Blaster TNT2 Pro graphics card, 19.1GB 7,200-rpm hard disk, 6X DVD drive, CD-RW drive, home-networking card, 19" monitor. \$2,382 direct. North Sioux City, SD; 800-846-4208; www.gateway.com.

● This Pentium III/550-based Gateway unit rivals any of our roundup's 600-MHz models in performance. It includes a collection of help tools on a par with those of Compaq, Dell, and HP while providing excellent performance under Windows, superb sound, and passable DVD video. The machine is attractively priced, especially since it includes a 19-inch monitor and a year of unlimited Internet access.

Like most of Gateway's mini-towers, the Gateway 550 is easily set up and easily serviced, with color-coded cables and ample print documentation. Peripherals include a pair of Boston Acoustics speakers, a small subwoofer, and a keyboard with several programmable hotkeys.

The 550 includes an NIC for use with Intel's AnyPoint home network, a CD-RW drive, and a DVD drive. The DVD

drive did not perform well on our CD-ROM WinMark tests but, together with a software-based MPEG decoder, managed fairly good if slightly grainy DVD video playback. Thanks to an ATA-4 hard disk controller and a fast graphics card, all other benchmark test scores were high.

The company's Gateway.net wizard provides quick access to the Internet. This system can be custom-configured and purchased over Gateway's Web site, though the site isn't quite as easy to use as that of Compaq, Dell, or Micron. But the product performs nearly as well as any machine on the market and is priced right for what it delivers.—CM

Hertz P550i

Pentium III/550, 16MB 3dfx Voodoo 3 2000 graphics card, dual 18GB 7,200-rpm hard disks, 6X DVD-ROM drive, Iomega Zip 100 Drive, 17" monitor. \$2,395 direct. New York; 888-222-7280; www.hertzttec.com.

● The Hertz P550i simply doesn't provide the feature set or the performance to justify its \$2,395 price. True, it comes with a RAID configuration of dual 18GB IBM Deskstar hard disks, but it has only a 550-

MHz CPU, a 17-inch monitor, a 16MB graphics card, and a disappointing generic-brand speaker combination.

One thing the system does very well is to allow quick, tool-free access to its interior. This model has six drive bays and enough slots for 768MB of memory.

Audio was understandably flimsy because of the terrible speakers, while the Sampo monitor had a small green patch in its upper-left-hand corner that no amount of fiddling could correct. Documentation in general was lacking. The benchmark test results were spotty; graphics performance was adequate, but most scores were subpar. All in all, we were disappointed with the overall value of this bundle.—AS

HP Pavilion 8500 Series

Pentium III/600, 32MB ASUS AGP-V3800 TNT2 Ultra graphics card, 19.5GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, Iomega Zip 100 Drive, 15" LCD monitor. \$3,209 direct. Palo Alto, CA; 800-322-4772; www.hp.com.

● This high-end home machine from Hewlett-Packard compares well with the top machines in this roundup. Its flat-panel display (an \$800 up-sell over HP's

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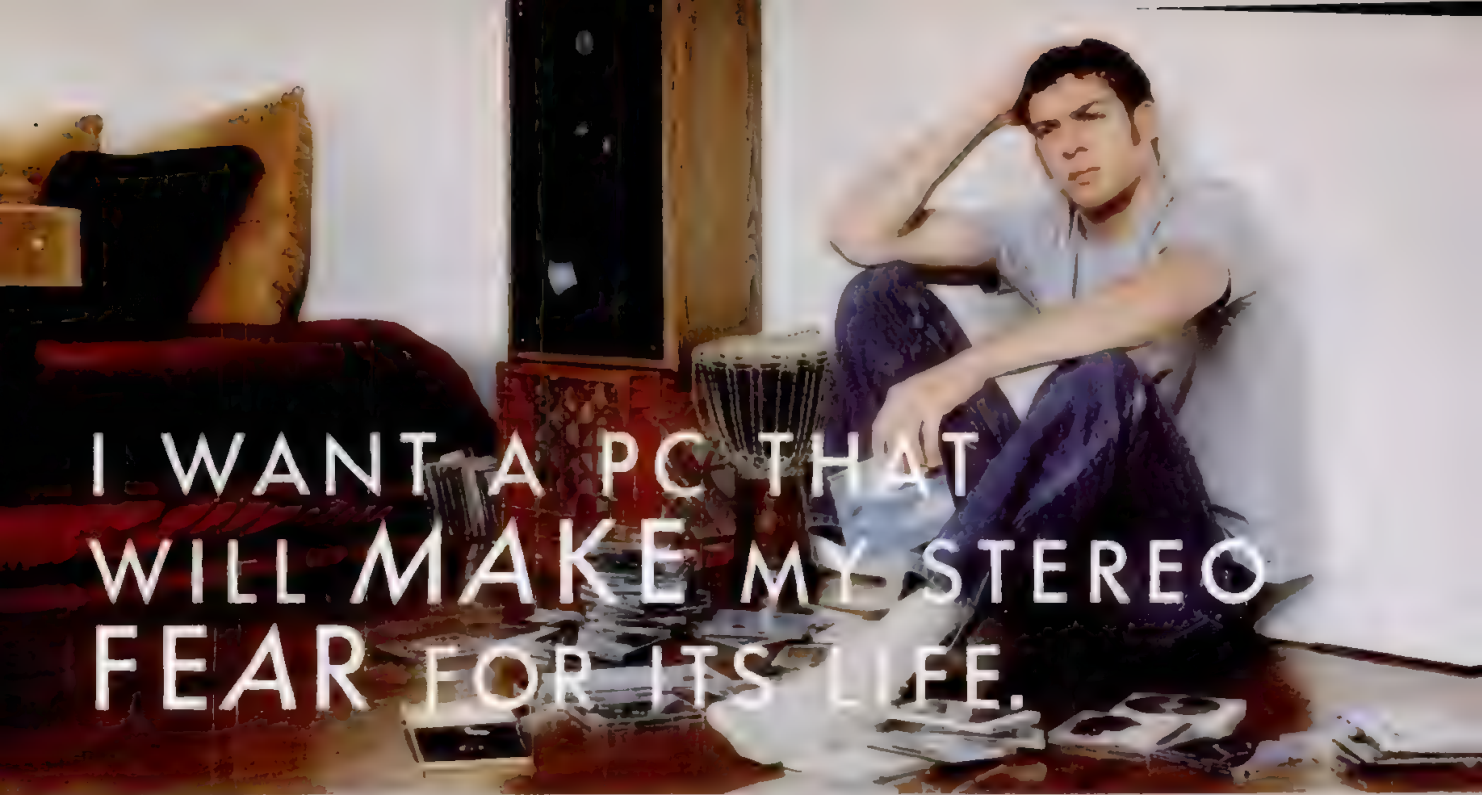
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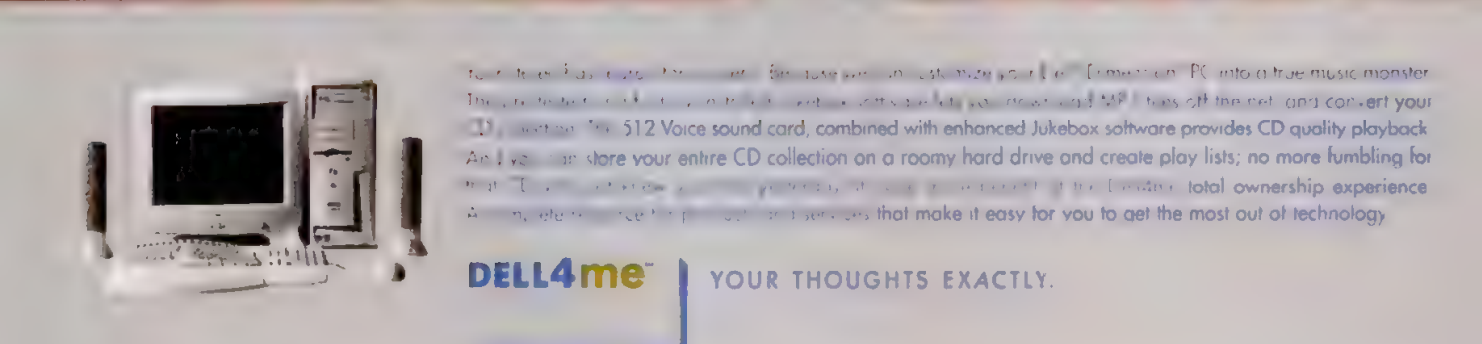
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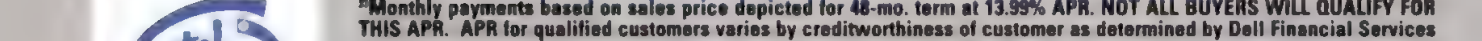
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Services L.P., 14050 Summit Dr., Austin, TX 78728, to U.S. state residents (including D.C.) with approved credit, excluding AR and MN residents. Availability may be limited or offer may vary in other states.

17-inch CRT) is simply beautiful, and the PC's performance scores were strong.

A home machine, the HP Pavilion 8500 Series sports colorful plastics (lavender and light gray) with rounded edges. Our test unit lacked a setup poster, and not all the cables were properly color-coded, but it was equipped with front-mounted USB and serial ports and a keyboard that offers extensive Internet and audio controls. The flat-panel display provides a brilliant picture and includes integrated stereo speakers as well as digital output. Since our machine came with both a CD-RW drive and an Iomega Zip Drive, it had little room for expansion: no free drive bays, one PCI slot, one IRQ.

Once you've powered up the system, you have access to brilliant on-disk documentation (which includes video tutorials), a customized Internet-access wizard (which supports four different Sips and provides information on DST services), and the HP Internet Center (which offers quick access to your favorite sites).

By the time you read this, you should be able to buy Pavilions online and custom-configure them as well. HP is now selling directly to end users and delivering proficient, easy-to-use machines.—CM

Highwave PPH550

Pentium III/550, 32MB Matrox Millennium G400 graphics card, 16.7GB hard disk, 6X DVD-ROM drive, Iomega Zip 250 Drive, 19" monitor. \$2,295 direct. San Jose, CA; 408-432-3888; www.highwavetech.com.

● The midpriced Highwave PPH550 delivered performance that slightly lagged behind others in its price range, but the system provides tangible extras for prospective buyers.

The unit comes with top-quality components, including an IBM Deskstar hard disk, a Matrox Millennium G400 graphics card, a Sigma MPEG decoder, and a 19-inch ViewSonic monitor. Moreover, the unit's front-panel air filter and four system fans

are intended to keep it up and running in harsh industrial environments, the company says.

With a boost from its Sigma MPEG decoder card, DVD playback was top-notch. But in general, this system performed below expectations. Highwave's Web site provides links to its component vendors' sites but little additional information. There is no toll-free contact number nor any Web-based sales. Still, if you need a roomy case impervious to dust and heat, this system is worth a look.—JAH

HiQ Impact 2000 Plus-600

Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, 16.7GB 7,200-rpm hard disk, 6X DVD-ROM drive, 120MB SuperDisk drive, 17" monitor. \$1,999 direct. Boston; 800-249-1886; www.hiq.com.

● The HiQ Impact 2000 Plus-600 combines an attractive price with above-average components and blistering performance—an enticing bundle for power users and the value-conscious alike. The lack of documentation keeps this machine from being in the same class as those from Compaq, Dell, HP, and others, but self-sufficient users will find a lot to like.

We were dismayed to find not only that there was a lack of overall system documentation but that many of the manuals for the peripherals were missing. But we like the dual-display-ready Matrox graphics adapter, which also delivers excellent software DVD playback. The combination of a three-piece Cambridge SoundWorks speaker system with a Turtle Beach card delivers excellent audio.

The Impact made a big

impact on our benchmark tests. It was the fastest Pentium III/600 on our Business Winstone and CPUmark tests: not bad for a system with a sub-\$2,000 price tag. The bad news: Forget online—no FAQs, no docs, just a slow, bare-bones FTP site.

Still, we like this system. If you must have value and power, and if you're comfortable operating without online support or documentation, this system represents a very compelling choice.—DAH

IBM Aptiva S-Series 865

Athlon/650, 32MB ELSA Erazor III TNT2 Ultra graphics card, 19.1GB 7,200-rpm hard disk, 8X DVD drive, 15" LCD monitor. \$3,750 street. Armonk, NY; 800-426-4968; www.ibm.com.

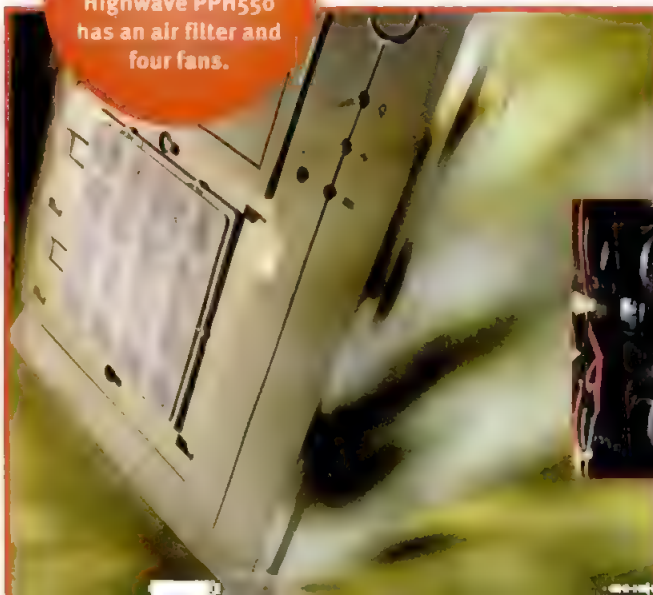
● Equipped with AMD's 650-MHz Athlon processor, an ELSA Erazor III card, and a high-quality flat-panel display, this \$3,750 IBM home machine affords good speed under Windows and outstanding graphics performance. Its one-year warranty is less than ideal at this price level, but few home PCs can match the power of the IBM Aptiva S-Series 865 or its attractive exterior design.

The Aptiva comes in an ebony black mini-tower case with matching display, keyboard, mouse, and two-piece Infinity stereo speakers that deliver brilliant audio. The system is easy to set up and use, though there is no full on-disk documentation or recovery CD. You can open the mini-tower without so much as undoing a thumbscrew, or you can quickly launch applications from Rapid Access keys on the keyboard. Uniquely, you can also remove the black cloth panels that cover the speakers and replace them with the included color panels. Another nice touch is the built-in home-networking adapter.

Initially, we had a few problems with the unit's ELSA graphics card, but once the company sent us a replacement for the card's BIOS, the machine settled down and managed above-average graphics scores. But we weren't impressed with the grainy DVD playback from the DVD Express software MPEG decoder.

IBM now sells Aptivas online. All in all, this model sits very near the top of today's home PC market.—CM

Designed for harsh industrial environments, the Highwave PPH550 has an air filter and four fans.



Kingdom Pinnacle 600S

Pentium III/600, 32MB ATI Xpert 128 graphics card, 17GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 250 Drive, 15" LCD monitor. \$3,497 direct. Mansfield, PA; 800-385-3436; www.kingdomcomputers.com.

● At first glance, the Pentium III-based Kingdom Pinnacle 600S seems to be a well-outfitted power system, thanks especially to its ultracrisp 15-inch ADI Microscan LCD and SCSI hard disk interface. On our tests, however, the Pinnacle lagged behind most other systems.

Kingdom Computers has included the comfortable Microsoft Natural Keyboard, but there is no organized set of documentation, and the components are average. The unit's benchmark test scores were average or below.

Internet support is barely passable: You'll find some very general and limited FAQs, some driver files, and specs. While the shopping area does have sections for corporate, education, medical, and government buyers, the overall experience is stripped down—nothing like that of a top-tier vendor's Web site.—DAH

Maximus Power Max 550

Pentium III/550, 32MB Matrox Millennium G400 graphics card, 17.2GB 7,200-rpm hard disk, 5X DVD-ROM drive, 19" monitor. \$1,999 direct. Irwindale, CA; 800-888-6294; www.maximuspc.com.

● Not the most cutting-edge system in this roundup, the Maximus Power Max 550 is hard to recommend over the competing sub-\$2,000 machines we tested from ABS, BOLDdata, and others. Since it offers little in the way of user-friendliness or service and support, would-be purchasers are better off looking elsewhere.

The one distinguishing characteristic of the Power Max 550 is the cordless Logitech keyboard and mouse. Annoyingly, the batteries were not included, but once powered, the two work fairly well. Otherwise, the Power Max 550 is unremarkable. Its test results were average, and Maximus Computer provides nothing to make the system easier to use beyond providing the standard component manuals and driver disks. Combine the system's blandness with the company's

limited tech-support hours and we would advise bargain hunters to keep searching.—Rich Brown

MaxTech MXA600S, MXP600S

MXA600S: Athlon/600, 16MB 3dfx Voodoo 3 3500 graphics card, 18GB 7,200-rpm hard disk, 4X DVD-ROM drive, 120MB SuperDisk drive, 15" LCD monitor. \$2,800 street.

MXP600S: Pentium III/600, 16MB 3dfx Voodoo 3 3500 graphics card, 16.7GB 7,200-rpm hard disk, 5X DVD-ROM drive, SuperDisk drive, 15" LCD monitor. \$2,800 street. Cerritos, CA; 562-921-1698; www.maxtech.com.

● MaxTech Corp. has priced both its AMD-based MXA600S and Intel-based MXP600S at \$2,800 street, an attractive price, since it includes a 15-inch LCD monitor and other quality components. Figure in good performance and these configurations are worth a look.

One fact that underscores the careful configuration of these systems is that even though both were loaded with peripherals, including fast Ethernet boards and SuperDisk drives, each had at least one free IRQ for further enhancements. In each case, the LCD monitors have integrated speakers for business audio applications, and each system is also bundled with a three-piece Altec Lansing set. For added multimedia flexibility, the 3dfx Voodoo 3 3500 TV card has an external I/O pod with input and output jacks for S-video, composite video, and left/right audio channels. The test scores of each unit were generally average for their class.

Both systems include Microsoft Office 2000 Professional Edition.

The support materials supplied with the MaxTech PCs get mixed reviews. The company does

include color start-up sheets and user manuals, but the latter are very general and only partially augmented by separate component booklets. Maxtech's Web site lacks a troubleshooting wizard, bug fixes, and BIOS updates, but it does include driver updates, order status links, and detailed option prices. Buying is easy with online system configuration.

These MaxTech's PCs are not inexpensive. But for a loaded, reasonably fast system with an LCD flat-panel monitor, all you have to do is decide whether you want AMD or Intel inside.—BB

Mega Impact PIII

Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, 19.1GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 100 Drive, 17" monitor. \$1,950 street. San Diego; 800-338-6628; www.megacs.com.

● The Mega Impact PIII is a PC of few frills and fewer surprises. Budget-conscious business buyers might like the above-average performance at a below-\$2,000 price, but the lack of fast DVD, hardware MPEG decoding, and top-tier 3-D performance rules this system out for entertainment-oriented customers.

Our first surprise in testing was a bright spark and a pop as the power supply blew out. There were other problems: The Escape key stopped working, and the monitor showed subtle pincushioning and keystoneing that we couldn't eradicate. The Genius NetMouse, a clunky device with some interesting buttons, had an awkward feel.

Despite these flaws, test performance was quite good, thanks in part to the Seagate Barracuda hard disk. The Matrox Millennium G400 MAX graphics adapter delivered excellent 2-D and good 3-D

graphics performance, and business users will like its dual-monitor support. Still, users on a budget should compare this system closely with affordable offerings from ABS and BOLDdata, which we preferred.—DAH

Each MaxTech configuration comes bundled with a 15-inch LCD monitor for a reasonable \$2,800.



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40	\$ 123	\$ 158	\$ 185	\$ 238	\$ 260
45	\$ 190	\$ 215	\$ 253	\$ 330	\$ 385
50	\$ 253	\$ 290	\$ 363	\$ 490	\$ 495
55	\$ 365	\$ 413	\$ 550	\$ 835	\$ 1,015
60	\$ 503	\$ 615	\$ 845	\$ 2,135	\$ 2,400
65	\$ 775	\$ 975	\$1,593	\$ 3,900	\$ 3,900
70	\$1,338	\$ 1,600	\$2,970	\$ 7,220	\$ 7,220
75	\$2,275	\$ 4,870	\$5,820	\$10,370	\$12,420

Male Premiums

Age	10 YEAR	15 YEAR	20 YEAR	25 YEAR	30 YEAR
35	\$ 123	\$ 138	\$ 165	\$ 223	\$ 253
40	\$ 148	\$ 183	\$ 225	\$ 288	\$ 335
45	\$ 225	\$ 300	\$ 360	\$ 450	\$ 513
50	\$ 338	\$ 455	\$ 525	\$ 743	\$ 828
55	\$ 500	\$ 670	\$ 768	\$ 1,640	\$ 2,330
60	\$ 783	\$ 990	\$1,335	\$ 3,630	\$ 3,630
65	\$1,330	\$ 1,650	\$2,693	\$ 5,250	\$ 5,250
70	\$2,473	\$ 3,175	\$4,860	\$ 8,790	\$ 8,790
75	\$4,400	\$ 7,443	\$9,600	\$13,260	\$15,030

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Micro Express MicroFlex-72A

Athlon/600, 32MB ATI Rage Fury 128 graphics card, 16.7GB 7,200-rpm hard disk, 6X DVD-ROM, 17" monitor. \$1,599 direct. Salem, NH; 800-268-0898; www.microexpress.com.

● As the least expensive Athlon-powered computer in this roundup, the Micro Express MicroFlex-72A mixes some quality components with some middle-of-the-road parts and comes up looking fairly well rounded. We found the price almost

too low to believe, but the company insists that buyers who specify package 72A will get this bundle for this price.

DVD watchers will appreciate the smooth playback from the Toshiba DVD-ROM drive accompanied by an ATI hardware decoder Gamers, however, will be disappointed, as the ATI Rage Fury 128 is not a wise choice for high-end 3-D gaming; it contributed to low scores on our 3D Graphics WinMark tests.

A fairly comprehensive though not configuration-specific manual is included both in print and on a CD-ROM, as were component manuals and software. The system also includes a generous four-year warranty. The Micro Express Web site offers drivers, contact information, and links to component manufacturers' Web sites. You can't order online, however; all purchases are handled by phone.—RB

BENCHMARK TESTS

Fast PCs: 550 MHz to 650 MHz



The Pentium III/733 may be king of the CPU hill in raw speed, but tick for tick, AMD's Athlon edges the Pentium at like clock speeds. But there's more to speed than just CPUs.

When you compare CPUs of the same clock speed, the champ is the AMD Athlon. The Athlon delivers four times the L1 cache of the Pentium III, plus the ability to decode any three x86 instructions at a time. The Pentium III, by contrast, needs two of the three instructions to be simple instructions. (A simple instruction is one that decodes to a single internal operation—called a *micro-op* by Intel and a *RISC-86 instruction* by AMD. The Athlon can dispatch up to nine RISC-86 instructions per clock cycle, while the Pentium III dispatches only up to five micro-ops.)

Perhaps the single score that can show off the new CPU champ best is the **ZD CPU Mark 99**, which measures the integer performance of the processor. The numbers are staggering: The average Athlon/600 posted 26 percent better performance than the average Pentium III/600. (For a detailed explanation of this and the other tests referred to here, see the Benchmark Tests sidebar on 700-MHz and 733-MHz systems, page 110.)

While a powerful processor is a great start to a top-performing PC, a well-tuned system will cross the finish line first, as shown by our **ZD Business Winstone 99** tests, which measure system performance while running typical business applications. Here, the average Pentium III/600 and Athlon/600 managed nearly identical scores. Indeed, the top Athlon/600—the SYS Performance 600A—and the top Pentium III/600—the HiQ Impact 2000 Plus-600—scored 27.6 and 27.8, respectively.

Our new **ZD Content Creation Winstone 2000** tests measure system performance using applications for creating Internet content. As with Business Winstone, for this score the disk, graphics, processor, and memory subsystems all play a part. Thus, it's not surprising that the scores for the average Pentium III/600 and Athlon/600 were again very close, with the Athlon besting the Pentium III by just over 2 percent.

Our **ZD Graphics WinMark 99** suite tests 2-D graphics capabilities. For nearly all 2-D business applications, any graphics card is fast enough. In this issue, we did some additional testing on the

Matrox G400 and RIVA TNT2 cards; we had the vendors submit both their base-clocked chips and their faster-clocked versions, the Matrox G400Max and the RIVA TNT2 Ultra. We found that for 2-D performance the different clock speeds had almost no impact: In general, boards based on either the Matrox G400 Max or the nVidia RIVA TNT2 Ultra scored best but negligibly better than boards based on the plain G400 and RIVA TNT2.

We let each vendor determine which disk subsystem was appropriate for each system. Besides the expected 7,200-rpm IDE drives, we received four 10,000-rpm and two 7,000-rpm SCSI drives. In addition, both SYS Technology and Polywell Computers went for a performance boost in each submitted system by including two IDE drives hooked to a Promise FastTrak66 IDE RAID controller configured in a RAID 0 setup (a technique commonly called *striping*). Configured correctly, they benefit from sequential sectors being written in an interleaved manner to each of the two disk drives. This improves the I/O performance by spreading the I/O load across the two drives. Our **ZD Disk WinMark 99** tests showed the two SYS systems to have the best-optimized RAID setup, while the two Polywells' setups produced just-average results.

ZD CD WinMark 99 tests a system's CD-ROM subsystem. Our tests brought out two important facts in CD-ROM performance. First, any DVD drive in this roundup is fast enough for today's games and applications, even those being authored for 4X CD-ROM drives (or better). Second, even small amounts of dirt, smudges, and scratches can have a major negative impact on drive performance. Some drive scores showed as much as a 50 percent swing in performance when tested with two different CDs.

The **ZD 3D WinMark 99** suite measures the graphics card's 3-D capabilities. These tests also reflect, to a lesser degree, the CPU's floating-point capabilities. We tested at our standard resolution and color depth of 1,024-by-768 with 16-bit color. To stress the graphics subsystem even more, we also tested at 1,024-by-768 with true color. Running neck and neck were the systems using cards based on the Matrox G400 Max and nVidia TNT2 Ultra chips. When scaled to true color, the G400 Max bested the TNT2 Ultra by nearly 4 percent. Both the TNT2 Ultra and G400 Max differ from their non-Ultra and non-Max siblings in clock speeds; they also have faster memory and graphics core clocks than their siblings.

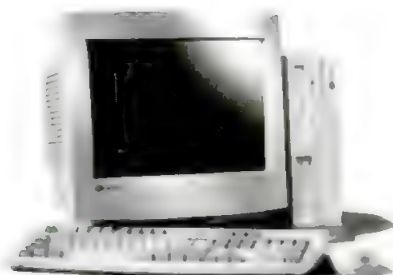
Interestingly, the Gateway Performance 550 came with a Creative 3D Blaster Pro. This is the first model with a new Pro version of the TNT2 chip. It's a TNT2 chip with its core and memory clocks set above the TNT2's settings. The card performed nearly as well as a TNT2 Ultra.—Analysis written by Rich Fisco

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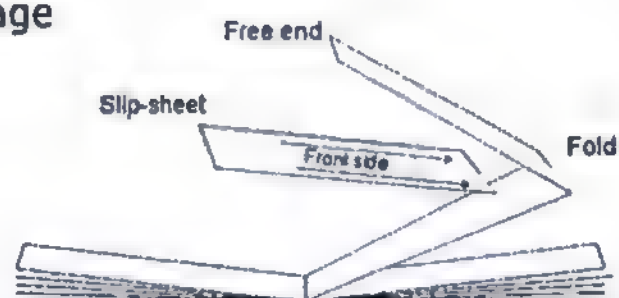


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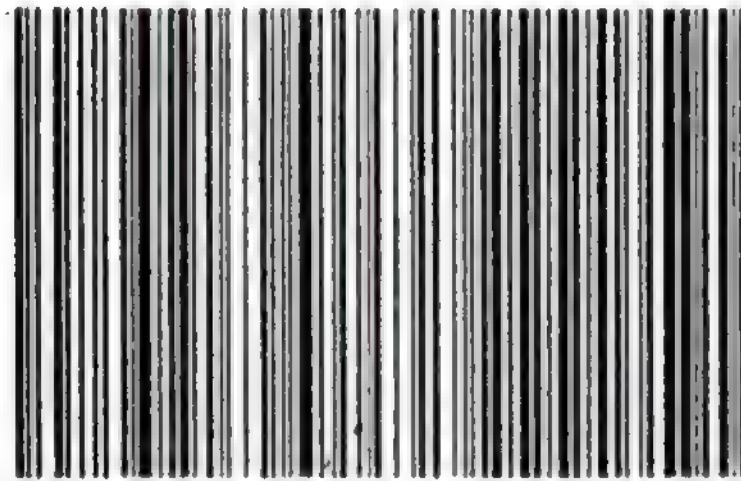
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2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

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Back

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Micron Millennium Max PIII 600

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 19.1GB 7,200-rpm hard disk, 8X DVD drive, 19" Micron monitor. \$1,932 direct. Nampa, ID; 888-634-8799; www.micron.com.

● The Micron Millennium Max PIII 600 isn't the fastest unit we tested, but its good components and attractive price make it our favorite for business power users watching the bottom line.

Thanks to a setup poster, reasonably helpful documentation, and a customized

Internet-access wizard, the Millennium is easy to set up and configure. As tested, the Internet wizard would connect only to the EarthLink Sprint ISP (45 free days of access, then \$19.95 per month), but it will soon support Micron's in-house ISP as well. All Internet users will have access to the new Micron Tool Box, a collection of software, backup tools, and online postage. Micron has also partnered with Host Pro to provide tools for creating and hosting e-commerce sites.

The Millennium's chassis was recently revamped; as a result, the side panel is easily removed, but it's quite difficult to get the panel back on. Test performance was average among PIII/600s but good for a sub-\$2,000 machine. And that price includes a 19-inch monitor and 8X DVD drive not found on other budget models.

Micron allows you to custom-configure and purchase its systems online. Micron.com's support is formidable, and the site will soon be transformed into a

BENCHMARK TESTS

High scores are best. Bold type denotes first place.		ZD Business Winstone 99		ZD Content Creation Winstone 2000	ZD 3D WinMark 99		ZD Business Disk Win- Mark 99 (thousands of bytes/sec)	ZD Business Graphics WinMark 99	ZD CD-ROM WinMark 99 (thousands of bytes/sec)
	Processor	Business Winstone 99	2D CPUMark 99		1,024 x 768, 16-bit color	1,024 x 768, true color			
ABS DVD Deluxe Edition	Pentium III/600	27.2	44.0	25.4	1,080	810	5,830	218	1,120
ACT Brilliantia DP 600	Pentium III/600	26.6	44.8	22.6	1,040	754	3,980	222	1,420
American Multisystems InfoGold PIII Pro	Pentium III/600	25.6	44.4	22.0	665	471	3,540	180	1,580
AST Premia/PS Series	Pentium III/600	26.1	44.0	24.2	665	405	3,930	188	1,010
Axis Orion 100V DVD	Pentium III/600	26.5	44.0	24.5	978	779	4,170	229	1,590
Axis Terra AXG	AMD Athlon/600	28.1	55.6	21.7	1,090	815	3,710	264	1,280
BOLData Xtreme 4900XPR	Pentium III/600	26.9	45.0	23.4	980	779	4,000	239	1,180
Compaq Prosignia Desktop 330	Pentium III/600	25.4	43.8	24.5	1,040	753	3,940	211	1,210
CyberMax Enthusiast PIII 600RM	Pentium III/600	26.8	44.1	23.9	970	667	3,870	225	1,300
Dell Dimension XPS T600	Pentium III/600	26.9	43.8	25.3	963	667	4,840	208	1,130
DTK APRI-80M/PIII600	Pentium III/600	26.8	44.7	25.0	999	865	4,310	240	839
Falcon Northwest Mach V	AMD Athlon/700	28.0	63.4	24.5	1,200	1,020	4,110	308	1,350
Future Power Series FP-7B50D	Pentium III/550	21.3	40.3	20.9	687	473	2,370	113	1,570
Gateway Performance 550	Pentium III/550	26.5	40.4	25.4	1,040	748	4,290	211	887
Hertz P550i	Pentium III/550	25.2	40.5	19.0	850	N/A	2,980	200	1,400
HP Pavilion 8500 Series	Pentium III/600	26.1	44.4	22.9	1,040	736	3,750	232	964
Highwave PPH550	Pentium III/550	25.5	40.4	19.7	934	773	3,410	217	1,420
HiQ Impact 2000 Plus-600	Pentium III/600	27.8	45.2	26.0	1,070	886	4,090	238	1,520
IBM Aptiva S-Series 865	AMD Athlon/650	27.3	58.7	27.2	877	782	4,410	301	1,360
Kingdom Pinnacle 600S	Pentium III/600	24.9	44.6	23.1	599	452	3,710	172	1,180
Maximus Power Max 550	Pentium III/550	25.2	41.6	21.9	973	775	3,970	219	1,100
MaxTech MXA600S	AMD Athlon/600	26.5	56.0	27.3	1,010	N/A	4,630	253	1,320
MaxTech MXP600S	Pentium III/600	26.0	43.8	22.9	803	N/A	4,460	193	1,450
Mega Impact PIII	Pentium III/600	27.3	43.8	25.7	978	778	6,240	236	751
Micro Express MicroFlex-72A	AMD Athlon/600	26.4	56.0	22.7	576	438	3,690	187	1,050
Micron Millennium Max PIII 600	Pentium III/600	26.2	43.9	20.5	935	590	3,590	211	1,430
NexTrend NexStar-2000	AMD Athlon/600	26.0	56.2	23.8	856	580	3,410	237	1,330
NexTrend NexStar-Pro	Pentium III/600	26.0	44.3	22.8	951	615	3,970	209	1,090
PC Connection Epiq BP8 8000	Pentium III/550	24.9	40.1	23.6	851	N/A	3,790	197	1,580
Polywell Poly 800B9	Pentium III/600	27.0	44.1	26.1	1,060	739	4,630	235	1,230
Polywell Poly 800K7-600	AMD Athlon/600	27.4	56.2	26.3	1,030	826	3,880	268	1,180
Premio Apollo BX 600	Pentium III/600	26.5	44.9	23.1	1,040	756	3,840	218	1,060
Quantex SM600 SE	Pentium III/600	26.9	43.9	24.4	969	658	4,470	237	1,500
Racer PM600i	Pentium III/600	26.3	43.5	24.6	1,040	753	4,440	209	1,060
Royal Power Desktop	Pentium III/550	26.2	41.7	22.0	N/A	N/A	3,930	215	1,220
SAG STA-DPOYIII-VVVK	Pentium III/600	27.0	44.8	25.4	1,060	766	4,610	239	1,160
Sony VAIO PCV-R539DS	Pentium III/550	25.6	40.7	22.8	866	490	4,480	183	1,380
SYS Performance 600A	AMD Athlon/600	27.6	55.6	27.5	1,060	869	5,290	269	830
SYS Performance 600P3	Pentium III/600	26.7	44.2	25.8	1,080	810	7,160	235	1,050
Systemax PVO-T600	Pentium III/600	27.3	44.0	25.0	970	658	4,410	221	1,110
Tangent Medallion	Pentium III/600	26.5	44.2	22.5	1,080	813	3,790	217	1,290
TigerDirect K-Series Extreme	AMD Athlon/600	27.4	55.8	25.3	1,090	824	4,300	264	1,060
Wintec Ultimate Edge	Pentium III/600	26.8	43.2	26.1	978	675	4,790	235	1,440
Wintec Ultimate Edge/A	AMD Athlon/650	27.8	59.4	19.0	964	667	5,870	288	968
XI 600 MTtower XP	Pentium III/600	27.1	44.5	25.2	1,060	880	4,260	241	1,690

N/A = Not applicable. The product could not run the test at this color depth.

▲ The Falcon Northwest Mach V had the top scores in the five cases where CPU speed matters most: ZD Business Winstone 99, CPUMark 99, 3D Graphics WinMark 99 (at two different color depths), and the 2-D Graphics WinMark 99. Falcon was able to submit a 700-MHz AMD Athlon-based system, while other PC makers' lines topped out at 650 MHz.

Machines from SYS Technology also had a strong outing. The company's Athlon/600-based SYS Performance 600A earned the top score

on our new Content Creation Winstone tests, while the Pentium III/600-based Performance 600P3 had the best score on our Disk WinMark tests, thanks to its RAID controller. Among systems without the additional RAID help, the Mega Impact PIII (using a 7,200-rpm Seagate EIDE drive) performed the best. Surprisingly, the Impact outperformed the four machines that came equipped with 10,000-rpm SCSI drives.

portallike page with a wide range of diagnostic tools. Meanwhile, the Millennia Max PIII 600 is an impressive machine at an aggressive price.—*CM*

NexTrend NexStar Pro, NexStar-2000

NexStar Pro: Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 18.2GB 10,000-rpm hard disk, 6X DVD-ROM drive, Zip 250 Drive, 19" monitor. \$3,219 direct. **NexStar-2000:** Athlon/600, 32MB Diamond Viper V770 Ultra graphics card, 18.2GB 10,000-rpm hard disk, 4X DVD-ROM drive, Iomega Zip 250 drive, 19" monitor. \$3,399 direct. Fremont, CA; 877-833-8833; www.nextrendpc.com.

● When a system exceeds \$3,000, you have a right to expect a few fundamental features, like hardware MPEG decoding, stellar documentation, and above all, extreme performance. Sadly, neither NexTrend Technology's Athlon nor its PIII fully delivers.

To its credit, NexTrend has put some impressive components into each unit, such as a 10,000-rpm IBM SCSI hard disk, an Iomega Zip 250 Drive, a 19-inch monitor, and excellent Altec Lansing speakers. It's what isn't here that's unforgivable: no hardware MPEG, no overall system documentation, and virtually no online support. And the performance was average or below average on most of our tests, belying the units' price.

Don't look to NexTrend for online anything. Support consists of a nine-question FAQ that includes basic questions like "What is SCSI?" and "What is DVD?" There is no provision for online ordering.—*DAH*

PC Connection Epiq BPS 8000

Pentium III/550, 16MB 3dfx Voodoo 3 2000 graphics card, 19GB 5,400-rpm hard disk, 6X DVD-ROM drive, 17" monitor. \$1,700 street. South Milford, NH; 800-800-5555; www.pcconnection.com.

● The PC Connection Epiq BPS 8000 is a great buy if you're looking for a white-box computer with no surprises. Targeted for small to medium-size businesses as well as education and government applications, the BPS 8000 is aggressively priced and includes brand-name standard components. With good performance within its CPU class, the BPS 8000 is a safe bet for buyers who don't need the fastest machine available.

Unlike other the other low-cost machines we tested, the BPS 8000 comes with

a system-setup road map and a comprehensive user manual, although many of the specific components in the tested system were not covered there. The case opened easily to reveal two free PCI slots and six available drive bays, with one free IRQ.

PC Connection will custom-configure systems, but roughly a dozen standard configurations are available for next-day delivery—long a strong point of this respected direct-channel vendor. Internet-based support is a bit light, but there is a troubleshooting wizard. For a good deal on a reasonably equipped machine and overnight delivery, the BPS 8000 is hard to beat.—*BB*

Polywell Poly 800B9, 800K7-600

Poly 800B9: Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, dual 23GB 7,200-rpm hard disks, 6X DVD-ROM drive, Iomega Zip 100 Drive, 19" monitor. \$2,500 street. **Poly 800K7-600:** Athlon/600, 32MB Diamond Viper V770 Ultra graphics card, dual 27GB 7,200-rpm hard disks, 4X DVD-ROM drive, Iomega Zip 100 Drive, 19" monitor. \$2,200 street. San Francisco; 650-583-7222; www.polywell.com.

● Polywell Computers' two power-user systems come packed with peripherals, including dual 7,200-rpm hard disks, Iomega Zip 100 Drives, and C-it USB video cameras. The Pentium III-based Polywell Poly 800B9 also features a Maxtor Millennium G400 MAX graphics adapter with dual monitor ports, while the AMD Athlon/600-equipped Poly 800K7-600 uses a Diamond Viper V770 Ultra. Polywell targets performance seekers with the two systems, offering buyers a choice of processors at attractive prices.

Documentation for both systems is limited, consisting of booklets for most but not all of the components installed in each computer. In terms of expansion, the Poly 800K7-600 had two free PCI slots and two free drive bays but no available system IRQs. The Poly 800B9 had one slot, one drive bay, and one free IRQ.



Unlike other budget-priced entries, the fine PC Connection Epiq comes with a setup poster and documentation.

The AMD-equipped Poly 800K7-600 was one of the fastest tested systems overall thanks to the processor, the 32MB nVidia RIVA TNT2 graphics adapter, and the dual 7,200-rpm hard disks. One nit: The unit's CyberLink DVD player requires you to start the software to view a DVD movie rather than automatically starting the movie when you insert a disk. The Pentium-based Poly 800B9, which loads both audio CDs and DVD movies automatically, was also a speedy performer.

Although you can start the ordering processing for a Polywell system online, the company's Web site does little to make the process easy or reassuring. Online help is limited to a technical-support phone number and a link to a third-party hardware vendor Web site. Still, these two units are solid offerings for experienced users who don't need much documentation or Web support.—*BB*

Premio Apollo BX 600

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 17.1GB 7,200-rpm hard disk, 5X DVD-ROM drive, 19" monitor. \$2,300 street. City of Industry, CA; 800-677-6477; www.premiope.com.

● The Premio Apollo BX 600 is an all-purpose machine suitable for mainstream business power users or for gamers. It's well priced for what it delivers, and it's worth a look.

Removing the Apollo's side panel to get inside the case is notably easy. Inside, the tested system offered two free external 5.25-inch bays, one free external 3.5-inch bay, and one free internal 3.5-inch bay. The system came properly configured for

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everything to work without problems, and its software MPEG decoding engine delivered smooth playback. Test performance was generally midrange, though 3-D graphics performance was excellent.

Premio doesn't sell its systems over the Web, but its site includes links to vendors' sites, and it offers reasonably good online support, with driver and BIOS updates and online documentation. All told, this is a more than adequate system at an enticing price.—*M. David Stone*

Quantex SM600 SE

Pentium III/600, 32MB Creative Labs 3D Sound Blaster TNT2 graphics card, 16.7GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 19" monitor. \$2,299 direct. Somerset, NJ; 800-346-6685; www.quantex.com.

● Quantex Microsystems' intuitive and well-appointed Web site makes it easy to purchase online. The Quantex SM600 SE proved reasonably quick compared with like-priced competitors and should be on your short list.

Our evaluation unit arrived loaded with goodies, including a CD-RW drive and a gorgeous flat-front 19-inch CRT monitor built around a Mitsubishi Diamondtron tube. In addition, the SM600 SE featured one of the most spacious interiors we've seen. The memory slots, two free PCI slots, and drive bays (two external, one internal) were easy to access. We only wish our machine had come with better Getting Started guidelines and online documentation.

The roomy interior of the Quantex SM600 SE makes it easy to service or upgrade

The SM600 SE ranked as one of the fastest PIII/600-based systems in this roundup, and DVD images were very crisp. Quantex has taken a number of cues from Dell with regard to its excellent Web site. Driver updates and support documents are easy to find, and configuring and purchasing a system are also a breeze. Well outfitted and well supported, the SM600 SE is an excellent value.—*AS*

Racer PM600I

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 19.1GB 7,200-rpm hard disk, 6X DVD-ROM drive, 19" monitor. \$2,800 street. Phoenix; 800-308-8767; www.racerpc.com.

● The Racer PM600I, from Racer Computer Corp., has a few minor details that set it apart from other look-alike systems in this roundup, but the lack of documentation and support make it best suited for the self-sufficient user.

One problem was the matching power and reset buttons, which look too similar; you can easily hit the wrong one. A nice touch is the motherboard diagram that is printed on the inside of a case panel. The system yielded lackluster test performance; its only bright spot was on the 3D Graphics WinMark tests, where its scores at both color depths were above average thanks to its nVidia RIVA TNT2-based graphics adapter.

Documentation and Web support are weak as well. The manuals consist

largely of separate pamphlets for the individual components, with no unifying guide. The company Web site has no online ordering, and online support consists mostly of links to the pages of the component manufacturers. If you want more than an assemblage of parts, look to the like-priced offerings from Dell, Gateway, and SAG. —*Alfred Poor*

Royal Power Desktop

Pentium III/550, 32MB Leadtek S320-II Ultra graphics card, 16.8GB 7,200-rpm hard disk, 6X DVD-ROM drive, Iomega Zip 100 Drive, 19" monitor. \$1,649 direct. City of Industry, CA; 800-486-0008; www.goroyalpc.com.

● Translucent purple plastic trim on the front and sides of Royal Computer's Royal Power Desktop made it stand out from the beige boxes on our test bench, but there's not much else (aside from its low price) to set it apart.

Uniquely, the installation instructions were specific to this model. Other perks include a 19-inch monitor and a scroll mouse. Fit and finish were a bit lacking; the disk drive bay cage was a bit flimsy, and the floppy disk drive was knocked out of alignment during shipment. The performance was passable for the price, though the nVidia RIVA TNT2-based Leadtek graphics card couldn't complete our 3D Graphics WinMark tests.

The Web support is weak, offering tech documents in Word for Windows format and limited online shopping features. Worse, the site includes the disclaimer "The prices calculated by the Royal Custom Configuration are approximations only"—which greatly limits its value for comparative shopping.—*AP*

SAG STA-DPOYIII-VWK

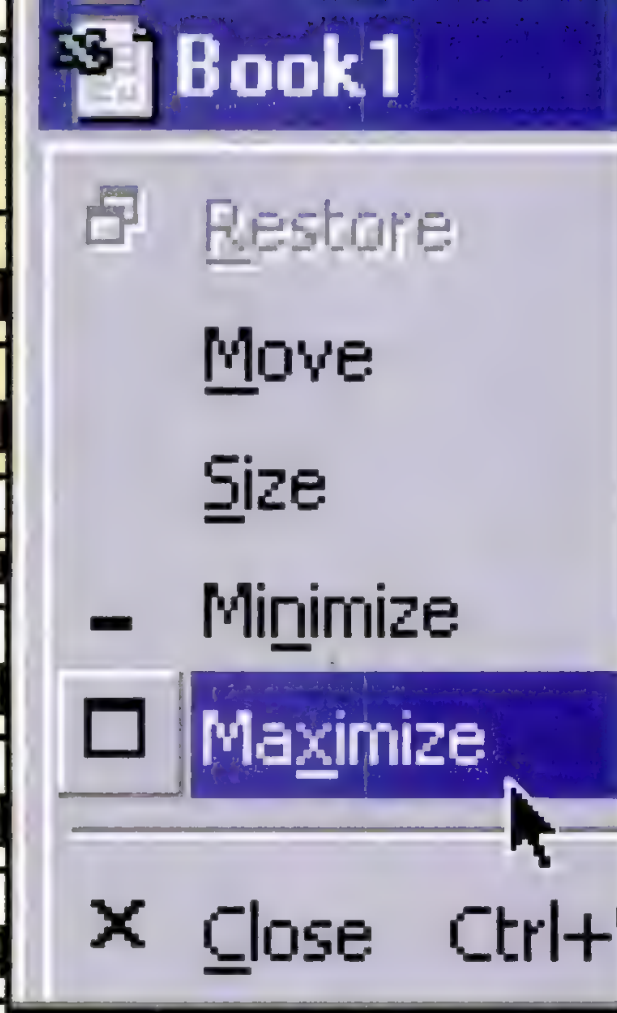
Pentium III/600, 32MB Matrox Millennium G400 MAX graphics card, 19.1GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 120MB SuperDisk drive, 19" monitor. \$2,400 direct. Downingtown, PA; 800-989-3475; www.sagelec.com.

● There's a lot to like in the entry from SAG Electronics. This large tower is competitively priced yet packed with options, and the dual-CPU-capable motherboard provides an upgrade path for the performance-obsessed.

As shipped, the SAG STA-DPOYIII-VWK had an ATA-4 hard disk controller that caused a conflict with the system's DVD player. Happily, SAG's tech support was aware of the problem, and the Web site contained the BIOS and driver upgrades needed to fix it. After the relatively painless upgrade, the unit worked like a dream. Hardware DVD decoding from Sigma, a fast SuperDisk floppy disk drive, a Sony Spresca CD-RW drive, and a gorgeous Hitachi 19-inch monitor rounded out a top-quality package but provided little room for expansion

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30,235.00	\$ 52,320.00
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beyond the three free DIMM slots.

Performance was excellent: The SAG had one of the top performance profiles among Pentium III-based machines in this roundup. SAG maintains a full-featured Web site, including fully customizable secure online sales and well-organized driver updates and FAQ files. This feature-packed system is worthy of careful consideration, and the option of adding a second CPU at a later date gives SAG's offering an edge.—JAH

Sony PCV-R539DS

Pentium III/550, 32MB ATI Rage 128GL graphics card, 27GB 5,400-rpm hard disk, 8X DVD-ROM drive, CD-RW drive, 17" monitor. \$2,350 street. San Jose, CA; 888-315-7669; www.sony.com.

● The Sony PCV-R539DS is aimed primarily at video and photography enthusiasts. If that's where your interests lie, it's a good bundle at a com-

movie playback was usually smooth, the image broke up occasionally.

Sony's Web site offers a full range of sales options and links to other vendors, as well as driver and BIOS updates, on-line documentation, and an online knowledge database. In short, this system offers solid support and enough digital-video-related features to make it interesting to its target market.—MDS

SYS Performance 600A, 600P3

600A: Athlon/600, 32MB Matrox Millennium G400 MAX graphics card, dual 9.1GB 7,200-rpm hard disks, 6X DVD-ROM drive, CD-RW drive, 19" monitor. \$3,000 street.

600P3: Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, dual 9.1GB 7,200-rpm hard disks, 6X DVD-ROM drive, CD-RW drive, 19" monitor. \$3,000 street. Cypress, CA; 800-613-9963; www.sys.com.

● SYS Technology's pair of Athlon and PIII offerings aptly demonstrate the edge AMD has grabbed in the processor wars. Though on the

pricey side, both systems offer an excellent complement of hardware and above-average benchmark test scores. Either would be good for power users, and the Athlon system would make an especially potent addition to a gamer's war chest.

Each system comes equipped with a different graphics adapter: the Athlon, with a Matrox Millennium

G400 MAX with dual VGA ports and hardware support for Windows 98's dual-monitor feature; the PIII, with a Diamond Viper V770 Ultra.

DVD playback on both machines, thanks to the hardware MPEG-2 decoder in the Creative DVD kit, is spectacular. Gamers will enjoy the combination of very crisp 19-inch KDS Visual Sensation monitors and the rocking Altec Lansing ACS54 speaker sets, which feature four rich satellite cube speakers and a booming subwoofer.

The only problem with such a loaded system is that there are no free IRQs and only one free PCI slot. A larger problem is the lack of overarching documentation on

how to set up, install, use, and troubleshoot the system. As for test results, the Athlon system turned in the fastest scores among 600-MHz Athlons on several tests. The PIII-based system turned in lower scores on these tests, although still generally placing above average among the PIII systems.

There's a RAID lying behind the scorching Business Disk WinMark scores of these machines. Both systems use a Promise ATA-4 RAID controller and two 7,200-rpm IBM ATA-4-compliant disks to set up a zippy two-disk RAID 0 (striping without mirroring).

Alas, when it comes to the Internet, SYS is stuck solidly in the minor leagues. The home page looks great, as do the pages of system specs, but click on the technical-support or online ordering button and you get "Under construction."

Still, thanks to excellent performance and top-drawer components, these are both very attractive systems.—DAH

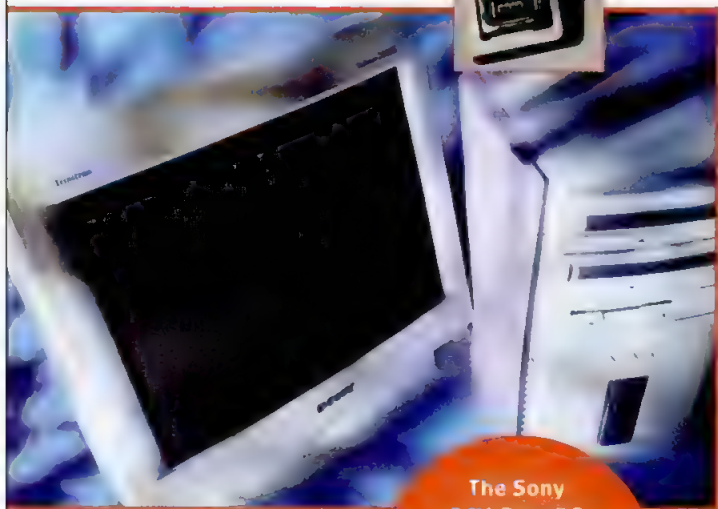
Systemax PVO-T600

Pentium III/600, 32MB Creative Labs 3D Sound Blaster TNT2 graphics card, 25.5GB 7,200-rpm hard disk, 6X DVD-ROM drive, CD-RW drive, 17" monitor. \$2,250 street. Port Washington, NY; 800-326-3917; www.systemaxpc.com.

● The Systemax PVO-T600 comes with a solid complement of components at an attractive price. It's a fine if unspectacular entry, so you may want to cross-shop competing models from such vendors as PC Connection, Quantex, or Sony.

Systemax hasn't skimped on the hardware; this model is equipped with a generous hard disk (which has a Promise Technology Ultra66 controller to speed performance), a Pioneer DVD drive, and a Creative Labs CD-RW drive and sound card. The system also has two IDE interfaces: the standard primary and secondary channels, plus two additional ports. There are limits to the system's expansion options, however. There was just one empty PCI slot, and only one IRQ channel was unassigned in this configuration. Test performance was average across the board.

Systemax sells its systems through other companies that are divisions of the same larger organization. The Web site contains some technical-support information, but to order the systems you are directed to the Web sites or toll-free numbers for Dartek, Global Computing Supplies, and MISCO.—AP



The Sony PCV-R539DS features a front-mounted IEEE 1394 port for DV input, plus video-editing software

selling price.

Component highlights include the dual hard disks (ideal for storing your video files separate from application files), an 8X Pioneer DVD drive, a Sony CD-RW drive (naturally), an Aureal Vortex 3-D sound card, and a Sony Trinitron monitor. The front-mounted IEEE 1394 ports (*iLink* in Sony-speak) make hooking up a digital video camera a snap, and Sony includes its fine video-editing software DVgate Motion and DVgate Still.

Overall test performance was good, especially for a 550-MHz unit, but the ATI Rage 128 graphics chip held back graphics performance. And although

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Tangent Medallion

Pentium III/600, 32MB Diamond Viper V770 Ultra graphics card, 22GB 7,200-rpm hard disk, 4X DVD-ROM drive, CD-RW drive, Iomega Zip 250 Drive, 19" monitor. \$1,695 direct. Burlingame, CA; 888-826-4368; www.tangent.com.

● The Tangent Medallion is a power user's machine at a surprisingly low price: \$1,695 direct. That alone should earn your attention.

The component roster is impressive: a 22GB hard disk, CD-RW and Zip drives, top-notch graphics and sound cards, and a 19-inch CTX monitor. Opening the Medallion's case is a bit of a puzzle but easy enough once you know how. Inside, you'll find plenty of room to grow, even with the DVD-ROM, CD-RW, and Zip drives installed.

Everything in the tested system worked without a problem. Movie playback was reasonably smooth but showed a constant, almost subliminal hint of jerkiness. Test performance was generally average for this class, while the nVidia RIVA TNT2 graphics chip delivered good 3D Graphics WinMark scores.

Tangent's Web site does not currently sell to the general public, but it does offer basic technical support for the system, including drivers and online documentation.—MDS

TigerDirect K-Series Extreme 600

Athlon/600, 32MB Diamond Viper V770 graphics, 17.1GB 7,200-rpm hard disk, 5X DVD-ROM drive, Iomega Zip 250 Drive, 19" monitor. \$2,749 direct. Miami; 800-879-1597; www.tigerdirect.com.

● The TigerDirect K-Series Extreme 600 is the direct-channel vendor's "Ultimate Performance PC," an appellation that serves this swift computer well. As one of the fastest systems in this roundup, the K-Series Extreme is ready to work and play.

The system comes with a setup guide and a comprehensive user manual. The case opens easily, revealing three free PCI slots and two available drive bays. One IRQ is also free. The 19-inch ViewSonic monitor included

with the tested system had an integral USB hub, with two USB ports on each side of the monitor (four in all)—convenient for hooking up peripherals such as digital cameras and joysticks. In benchmark testing, the K-Series Extreme proved one of the fastest systems.

TigerDirect's Web-based support and sales content help you before and after purchase. BIOS upgrades are not available online, but there is a helpful troubleshooting wizard with bug fixes and driver upgrades. Truly a power user's system, the TigerDirect K-Series Extreme 600 is a speedy choice.—BB

Wintec Ultimate Edge, Ultimate Edge/A

Ultimate Edge: Pentium III/600. \$3,180 street.

Ultimate Edge/A: Athlon/650. \$3,280 street. Both systems: 32MB Matrox G400 graphics card, 17.1GB 10,000-rpm hard disk, 6X DVD-ROM drive, Castlwood Orb 2 drive, 17" monitor. Fremont, CA; 800-379-0110; www.bananapc.com.

● We tested two different Ultimate Edge systems, from Wintec Industries. They were configured identically except for the processor and motherboard: One had a 600-MHz Intel Pentium III; the other, a 650-MHz AMD Athlon CPU. The Ultimate Edges are designed for performance applications, and we found that the Athlon model did a better job of attaining this goal. But note that machines we tested from Dell, IBM, SYS, TigerDirect, and others delivered similar or better performance for less money.

Setup is relatively easy, with a road map that is useful but generic, though the documentation is merely a collection of component pamphlets. Expansion options are limited. The Pentium model we

saw did not have any free PCI slots, and the AMD had only one. Neither had any unassigned IRQ channels, nor any available internal drive bays. Each did have three open external bays.

The systems have Matrox graphics adapters with two monitor ports each, so you can connect two displays to the same system. Instead of IDE drives and software MPEG-2 decoding, the systems have Adaptec SCSI controllers and hardware MPEG-2 decoding. Performance was good to excellent across the board for both, with the Athlon machine edging out the Pentium on several tests.

The Wintec Web site gets mixed reviews. As a source of technical information and support, it's a bust. The online shopping features are adequate but not spectacular.—AP

Xi 600 MTower XD

Pentium III/600, 32MB Matrox G400 MAX graphics card, 21GB 7,200-rpm hard disk, 6X DVD-ROM drive, 17" monitor. \$1,699 direct. San Clemente, CA; 800-432-0486; www.xi-computer.com.

● The entry from Xi Computer Corp. is priced at the low end, and although it has a few attractive features, it is lacking in a number of areas. Gamers may be drawn to its good graphics performance, but on the whole we preferred the sub-\$2,000 entries from ABS, BOLData, and Micron.

System setup is not for novices, as there is no road map or configuration instructions. Some steps are not straightforward; for example, the USB mouse connects to a PS/2 mouse port using an adapter. Documentation consists of pamphlets from component manufacturers.

The system provides hardware MPEG decoding, and the Matrox graphics card supports two separate monitors at once.

The card achieved faster-than-average 3D Graphics WinMark scores, but the rest of the benchmark test results were average.

Xi's Web site offers limited technical-support features. All in all, the Xi unit ends up among the also-rans.—AP

The TigerDirect machine is an excellent performer, and its ViewSonic monitor features four USB inputs





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Speech Recognition

By Greg Alwang

A year ago, accuracy hovered around 80 to 90 percent; this year it's as high as 98 percent.

The accuracy of past generations of speech recognition software topped out at a little more than 90 percent (nearly one error every ten words), making them questionable as productivity-enhancing tools. The good news about the latest speech software is that most of the products provide recognition accuracy above 95 percent and help you get more done in less time—as long as you have sufficient PC speed, an adequate sound card and microphone, and the ability to speak clearly at all times.

Speech recognition is moving closer to the mainstream and certainly finding its niche in the medical and legal communities, where specialized vocabularies are used. But don't give up your keyboard

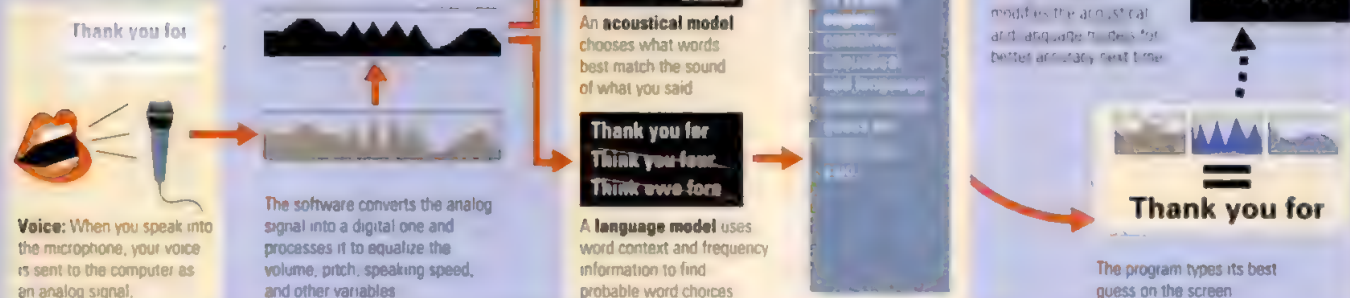
and mouse just yet. These programs are meant to supplement traditional means of input, not replace them. They can provide a big productivity boost for users with limited typing skills (although investing in typing tutor software might be more worthwhile in the long run). But for those with disabilities, repetitive stress injuries or who just always have their hands full, these products are a boon.

For this roundup, PC Magazine Labs tests the latest upgrades from the four major continuous-speech recognition players: Dragon NaturallySpeaking Preferred 4.0, Philips' FreeSpeech 2000, L&H Voice Xpress Professional Version 4.0, and IBM's ViaVoice Pro Millennium Edition. All the vendors have refined their speech engines, improved usability, and

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How Speech Recognition Works



extended command and control and Natural Language Command (NLC) support to work across a wider range of applications, like Microsoft Excel and Outlook.

It's clear from our test results that accuracy is improving, with even less training time. In last year's roundup ("Speech Recognition: Finding Its Voice," October 20, 1998), our testers achieved an average accuracy of 80 to 90 percent. But for this year's story, initial accuracy ranged from 91 to 95 percent across the board, and accuracy improved with longer use, rising as high as 98 percent in the case of ViaVoice.

Better accuracy comes courtesy of more intelligent language models. During our tests, we saw better overall word selection based on context from NaturallySpeaking and ViaVoice. This not only produced better accuracy but resulted in automatic capitalization and punctuation, saving us time when it came to revising and correcting dictations. NaturallySpeaking, Voice Xpress, and ViaVoice now require about 10 minutes of reading to train them, instead of the 30-plus minutes required last year. In most cases, you can install and be dictating with decent accuracy after just a little more than 20 minutes. (The exception is FreeSpeech, which takes closer to 30 minutes.) Tutorials and quick-reference cards are essential for learning the basics of dictation, navigation, formatting, and command and control.

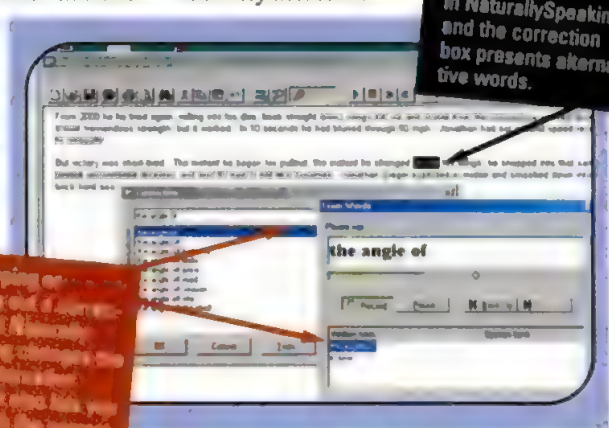
Voice Xpress and ViaVoice have always had strong support for controlling

your Windows desktop and other applications using natural-language commands, and now they've extended that to support Microsoft Office 2000-specific commands like "send as e-mail" or "save as Web page." All the products let you create voice macros for inserting text or dictate into any Windows application, and all but NaturallySpeaking allow reliable voice commands that start programs and run prerecorded keyboard/mouse macros.

All the products in our roundup offer some voice-enabled Web features. NaturallySpeaking's NaturalWeb is the simplest to use for surfing the Web. It lets you easily enter URLs and select links on pages by voice. ViaVoice dynamically indexes each page as it loads and displays a number next to each link (even hidden links), so you can just say the number to select a link. ViaVoice also supports Chatter's Jargon, a vocabulary for Internet chat programs. FreeSpeech dynamically updates its Command Explorer based on the currently loaded Web page to show all available voice-enabled links, and Voice Xpress comes with WebFinder, a voice-enabled meta-search tool. Surfing the Web with a mouse

and keyboard still makes more sense, but in the future this voice recognition technology could be used to surf the Web on smaller, hand-held devices.

Speech recognition software has come a long way in the past year. Read our reviews to see whether one of these programs has the voice features that fit into your everyday computer use—and you just may see a real productivity increase.



Dragon NaturallySpeaking Preferred 4.0

List price: \$199. Requires: Pentium MMX/200 or equivalent; 48MB RAM; 200MB hard disk space; 16-bit Creative Labs Sound Blaster-compatible sound card; Microsoft Windows 95, 98, or NT. Dragon Systems Inc., Newton, MA; 800-437-2466, 617-965-5200; www.dragonsystems.com.



Our Editors' Choice in this roundup, Dragon NaturallySpeaking Preferred 4.0, sets the standard for usability, from its streamlined enrollment to its easy formatting and voice-enabled Web surfing. With improved optimization for new processors and enhancements in word

Our Contributors: DAN NEWMAN is the author of *Speech Recognition Made Easy*. GREG ALWANG is a contributing editor of *PC Magazine*, and MATTHEW GRAVEN is an associate editor of *ZDNet*. Associate editor NANCY E. HIRSCH and *PC Magazine* Labs project leader DIANE JECKER were in charge of this story.

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^oCD-ROM speeds: 40X max./17X min., 32X max./17X min., 24X max./12X min. ^{oo}Micron Leasing arranged by an independent entity to qualified commercial customers. Listed lease payments based on 48 notice or obligation.

and command recognition, NaturallySpeaking provides impressive accuracy right out of the box. It is hindered only by limited natural-language support in applications other than Microsoft Word.

NaturallySpeaking's initial accuracy tied with our honorable mention, ViaVoice, at 95 percent, but while ViaVoice rose to 98 percent with additional training, NaturallySpeaking peaked at 96 percent. Our testers, however, unanimously reported having the fewest problems getting NaturallySpeaking to understand voice commands for navigation and formatting.

NaturallySpeaking's New User Wizard complements the printed manuals and Quick Reference pamphlet, guiding you through microphone adjustment, training, and vocabulary extension. Like Voice Xpress's Quick Tour, NaturallySpeaking's Quick Tour covers basic dictation techniques, voice commands, and examples, so you can begin quickly.

After you train for 5 minutes, NaturallySpeaking spends about 2 more minutes fine-tuning the base language model to your voice and pronunciations. The Vocabulary Builder imports single words, lists of words, or entire documents and conveniently lets you train all or selected new words immediately after importing. As with ViaVoice, you can import documents to enhance recognition.

NaturallySpeaking has intuitive dictation and formatting shortcuts. Merely say "cap," for example, or "all cap" to capitalize. Our testers found this easier than saying "capitalize" in FreeSpeech and Voice Xpress or the even longer "capitalize this" in ViaVoice. When you make a correction, NaturallySpeaking prompts you to say the correct word and the incorrect word, which helps it to learn how you pronounce both words. Spelling correction works well as long as you speak slowly and without hesitation. NaturallySpeaking is the only product here that lets you dictate, correct, and train hands-free.

NaturallySpeaking combines accuracy and usability like no other product in this category. Though weak in NLC support compared with Voice Xpress and ViaVoice, NaturallySpeaking is the best choice for dictating.—Greg Alwang

Editors' Choice

Dragon NaturallySpeaking Preferred 4.0



This year's speech recognition testing showed accuracy improvements across the board, with the highest score—98 percent—going to IBM's ViaVoice Pro

Millennium Edition. But accuracy scores are only part of the equation, and to achieve those scores you'll have to use the programs' navigation, correction, and formatting features, which is why our Editors' Choice goes to NaturallySpeaking.

With its peak accuracy score at an impressive 96 percent, NaturallySpeaking falls only slightly behind ViaVoice. And once you factor in the program's intuitive editing features—essential to achieving such accuracy—NaturallySpeaking pulls ahead. Take, for example, the commands for capitalization. ViaVoice requires you to say "capitalize this" before a word, but NaturallySpeaking achieves the

same result with simply "cap." And our testers found that ViaVoice was likely to misinterpret the command, while NaturallySpeaking worked almost without fail.

We can't ignore ViaVoice's impressive accuracy scores, so we're giving it an honorable mention in this roundup. We also liked ViaVoice's advanced macro capabilities, which will surely appeal to more advanced users. ViaVoice is the only program that lets you learn from or disregard the styles of imported documents, which is helpful when importing documents other than your own. With some improvements to the program's usability, ViaVoice would be the program to beat.

FreeSpeech 2000

List price: With Plantronics headset, \$99.99; with Philips SpeechMike, \$149.99. Requires: Pentium/MMX 166 or equivalent; 48MB RAM; 100MB hard disk space; Sound Blaster-compatible sound card; Microsoft Windows 95, 98, or NT with SP3. Philips Speech Processing, Atlanta; 888-773-3244, 770-821-2400; www.philips.com.

● Philips Speech Products' FreeSpeech 2000 shows many improvements over its predecessor, including support for dictation in six languages, voice macros, and improved accuracy. And it still comes with the handy Philips SpeechMike (a combination microphone, trackball, and speaker). But low accuracy scores, limited documentation, and the fact that you must manually switch between dictation and command modes hinder FreeSpeech's usability.

FreeSpeech, with an initial accuracy score of 91 percent, has improved substantially since its previous version. But in a category where a couple of percentage points affects the product's usefulness, this is a low score. FreeSpeech also came

in last for final accuracy, at 93 percent. We tested FreeSpeech with both the SpeechMike and the supplied Plantronics SR1 headset. We got acceptable sound quality during audio setup with the SpeechMike, but only after three tries. The program also lacks a quick-reference card and includes sparse command documentation.

Dictation mode has an EasyEdit feature, which highlights words as the dictation plays back, and the program's EasyCorrect lets you pause playback and replace the highlighted word from a list of alternatives. You can train pronunciations while correcting single words but not when correcting a phrase.

To use menu commands and dialog boxes or to navigate around a document, you must switch to Command mode using the toolbar or a special SpeechMike button. This can be cumbersome, especially compared with the other programs, which are all modeless now. The SpeechMike button should have made the process a little easier except that when you release the



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Speech Recognition

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Users will find greater accuracy and usability in the other programs in this roundup. And many speech users will quickly tire of manually switching between FreeSpeech's modes.—GA

**L&H Voice Xpress Professional,
Version 4**

● **L&H Voice Xpress Professional** provides the basics one expects in a speech recognition program: You can dictate into any application, create voice macros, and control applications with spoken commands. The program's strength is its intuitive natural-language commands for Microsoft Word, Excel, and the simple Voice Xpress word processor. But its correction features are limited—lacking, for example, audio playback.

The correction window in Voice Xpress lets you teach the computer how you speak (here, "PC" was misrecognized as "BC").

You can apply for a new voice communication system such as "hold"

Like ViaVoice, Voice Xpress lets you back up your voice files easily to an Iomega Zip Drive or other secure location. The program includes Talking Tools, a collection of voice-activated applets, including a simple calendar and clock. Users looking to control Excel and Word by voice may find Voice Xpress an



cation integration rating reflects the product's strength in accepting dictation to command and control applications other than word processing (such as the Windows desktop, spreadsheets, and Web browsers). The **command and control** rating reflects the application's ability to use voice commands to navigate menus and dialog boxes, as well as its ability to create robust command and control macros.

	Enterprise Edition			
	Dragon Naturally-Speaking Preferred	FreeSpeech 2000	L&H Voice Xpress Professional	ViaVoice Pro Millennium Edition
Training	Excellent	Fair	Good	Excellent
Dictation and correction	Excellent	Fair	Good	Good
Application integration	Good	Good	Good	Good
Command and control	Good	Good	Good	Excellent



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Dictation on the Go

The advantages of speech recognition technology aren't confined to your desktop. When you're on the go, you can use a digital recorder to dictate memos, e-mail messages, and meeting notes that can later be transcribed into various programs. And with recorders becoming smaller, you'll hardly notice one in your pocket.

Besides its compact size and improved sound quality, a digital recorder offers many advantages over an analog tape recorder, such as never having to fast-forward or rewind to find a precise point in your recording. Both of the recorders we tested—the Dragon NaturallySpeaking Mobile Recorder R1 and the Olympus DS-150 Digital Voice Recorder—let you dump the recordings onto your hard disk via an included serial cable.

The smaller recorder of the two we tested, the **Olympus DS-150 Digital Voice Recorder** (bundled with L&H Voice Xpress Mobile Professional, \$230 street), is also the easier to use. Much of the Olympus's functionality is like that of a standard tape recorder, with accessible play, record, stop, and cue controls. The LCD shows which recording is selected, a time counter, and more. A dial located under your thumb lets you quickly move through menu options and recordings. There are external microphone and headphone jacks but no dedicated volume dial (to adjust the volume, you must use the menu control dial). The Olympus lets you insert index markers into continuous recordings, making it even easier to access the information you want quickly.

The Olympus can record 75 minutes of dictation at its highest-quality setting or 160 minutes in long-play mode. Keep in mind, however, that for transcribing voice to text, you'll want the best recording possible, so count on being limited to 75 minutes. To conserve memory, you can use the unit's Variable Control Voice Actuator, which stops recording after 2 seconds of silence and resumes when sound is detected. (Olympus America Inc., Melville, NY, 516-844-5000, www.olympus.com.)

The Dragon NaturallySpeaking Mobile Organizer software (\$400 street) includes the **Dragon NaturallySpeaking Mobile Recorder R1**. The Dragon Recorder offers many of the same features as the Olympus, such as transport controls, editing capabilities, and files for organizing your recordings. Unlike the Olympus, it also includes special capabilities for recording notes and tasks, letting you automatically enter contact data and meetings into pro-



grams such as Lotus Notes and Microsoft Outlook as well as compose and send e-mail messages from multiple e-mail clients.

The Dragon Recorder includes 4MB of internal memory, which lets you record 40 minutes at the highest-quality setting (recommended for voice-to-text operation) or as much as 74 minutes in long-play mode. Unlike the Olympus recorder, the Dragon Recorder also lets you expand the storage capacity with 2MB, 4MB, and 8MB SmartMedia cards.

The Dragon Recorder's controls seem clunky, and the microphone is awkwardly placed. Another inconvenience is that the recorder has no stop button. To stop playback, you must hit the play button, and to stop recording you hit the record button. The recorder does include jacks for an external microphone and headphones. When recording actions, you must stop after each action instead of just pushing a button, as on the Olympus recorder.

If transcribing notes and tasks directly into multiple programs is appealing, the Dragon Recorder is an excellent choice. Just consider that even if you've already trained Dragon Recorder to recognize your live voice, Dragon suggests that you train it separately for your recorded voice. (Dragon Systems Inc., Newton, MA, 800-437-2466, www.dragonsystems.com.)—Matthew Graven

adequate choice. But it isn't as rich in features as the other programs in our roundup.—*Dan Newman*

ViaVoice Pro Millennium Edition

Street price: \$180. Requires: Pentium/233 or equivalent, 48MB RAM with Microsoft Windows 95 or 98, or 64MB with Windows NT; 100MB hard disk space; 16-bit sound card. IBM Speech Systems, West Palm Beach, FL; 800-825-5263; www.ibm.com.

● Our honorable mention in this roundup, IBM's ViaVoice Pro Millennium Edition, provides a wide range of functionality for both dictation and controlling applications, as well as the best

accuracy scores of the group. Novices will be able to get started quickly, while power users will appreciate the program's advanced macro capabilities. Our testers, however, found some of ViaVoice's editing features awkward, a big factor in its overall usability.

Installation and initial setup went smoothly, thanks to well-designed wizard screens and an animated character that explains how to start. Users can expect to be dictating within 20 to 30 minutes of software installation, including 10 to 15 minutes of reading enrollment text.

On our tests, ViaVoice was the most accurate product. Initial accuracy after enrollment was 95 percent, which rose to an outstanding 98 percent when we dictated the same document after making corrections. In daily use, most users should attain accuracy somewhere between these two numbers.

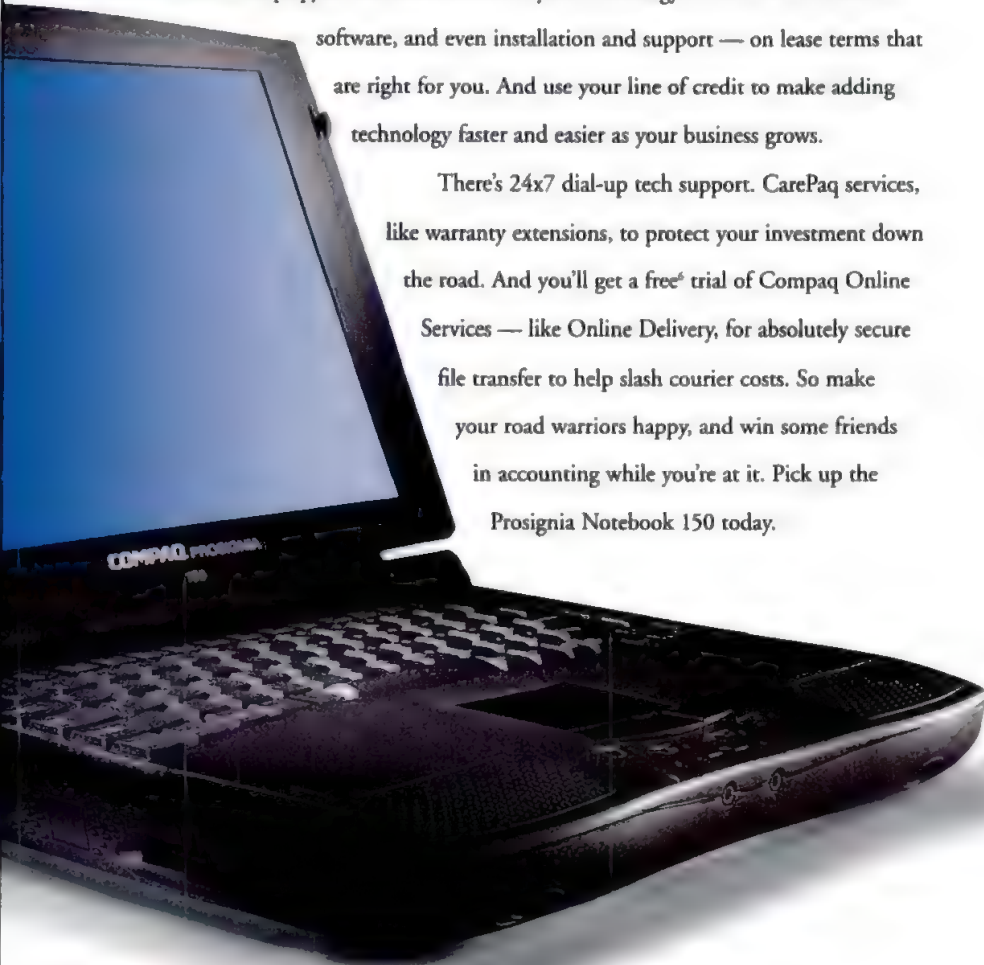
ViaVoice, like the other products we tested, lets you control menus and dialog boxes in most Windows programs, with natural-language commands available for Microsoft Word and Excel, among others. ViaVoice also lets you surf the Web by voice-enabling Internet Explorer. Natu-

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BENCHMARK TESTS

Speech Recognition



The speech recognition category as a whole has matured considerably since our last roundup, and both Dragon NaturallySpeaking and IBM's ViaVoice show impressive accuracy improvements.

After we performed the vendor's recommended training procedure and additional training, Dragon NaturallySpeaking Preferred achieved an impressive 96 percent accuracy rate (compare this against its 91 percent rate from last year). This means that on a 1,000-word document, you should now get about 40 errors, cutting the number by slightly more than half. But this still leaves the question of whether you can live with 40 errors in a 1,000-word document. We feel that for speech dictation software to become a truly mainstream productivity application, there would need to be no more than 10 errors in a document of this size—or 99 percent accuracy.

ViaVoice Pro Millennium Edition had an initial accuracy rating of 95 percent. We found, however, that with repeated use there was an average accuracy increase of 3 percent, for an ultimate score of 98 percent. FreeSpeech 2000 and L&H Voice Xpress Professional came in behind, with accuracy scores improved from last year but still below 95 percent.

Accuracy is enormously important, but equally important are the speed and ease with which a user can correct mistakes. Our throughput test measures the speed at which testers using speech dictation software produced documents that were 100 percent accurate. We instructed our testers to use voice commands in combination with the keyboard. The individual throughput scores ranged from 19 to 39 words per minute, significantly higher than last year's 12.8 to 18.4 words per minute.

The gap is closing between our testers' speeds using the keyboard alone and using voice dictation to produce a completely accurate document. Tester number 2 was actually more productive using either NaturallySpeaking or ViaVoice than using the keyboard. Tester number 3 had similar results with NaturallySpeaking, as did tester number 4 with ViaVoice. FreeSpeech's slow average score of 24 words per minute clearly showed that its modal implementation is a hindrance to producing a completely accurate document quickly. ViaVoice produced the second-highest average throughput score, but the testers felt that ViaVoice's correction procedure was counterintuitive and far too cumbersome. The fact that ViaVoice produced relatively accurate results initially may have inflated its throughput score.

Last, we wanted to check to see what benefit there was, if any, in upgrading a PC to a Pentium III-class system, as many of the vendors claimed there would be added benefits using this processor. We found the accuracy to be about the same with a Pentium II and a Pentium III. But the process of getting up and running, from software installation and enrollment to adding documents to build the vocabulary, was faster on a Pentium III. Training times remained about the same, but the Pentium III processed the

ACCURACY

High scores are best.

Bold type denotes first place.

denotes Editors' Choice

Tester	Percentage (Initial/Final)				Average
	1	2	3	4	
Dragon NaturallySpeaking	96/96	93/95	96/96	96/95	95/96
FreeSpeech 2000	91/95	87/92	92/94	95/92	91/93
L&H Voice Xpress Professional	91/93	93/93	92/96	95/95	93/94
ViaVoice Pro Millennium Edition	94/98	96/98	93/99	96/97	95/98

THROUGHPUT

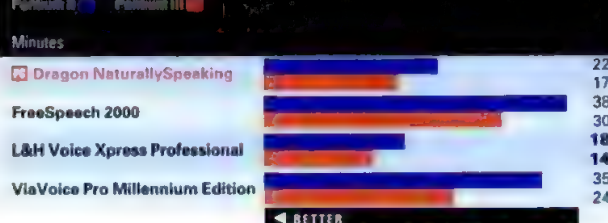
High scores are best.

Bold type denotes first place.

Tester	Words per minute				Average
	1	2	3	4	
Keyboard	48	31	28	34	35.3
Dragon NaturallySpeaking	38	39	31	31	34.8
FreeSpeech 2000	23	30	21	22	24.0
L&H Voice Xpress Professional	28	24	21	33	26.5
ViaVoice Pro Millennium Edition	32	35	19	37	30.8

AVERAGE SETUP TIME

Pentium II Pentium III



▲ While all the products give you over 90 percent accuracy after initial training, ViaVoice hit an impressive peak accuracy of 98 percent. Despite much improvement with all of the pro-

grams tested, your throughput is most likely still going to be faster on the keyboard—but NaturallySpeaking is closing in. Setup times hit a record low with ViaVoice's 14- and 18-minute scores.

training files faster, cutting anywhere from 4 to 11 minutes off the total setup time.

How We Tested

Our team of four testers, two men and two women, installed each program using its default settings, first on an NEC Direction SPL300 (a 300-MHz Pentium II with 128MB of RAM, running Windows 98 and with a Creative Labs Sound Blaster Live! sound card) and then on a Dell Dimension XPS t550 (a 550-MHz Pentium III with 128MB of RAM and a Creative Labs Sound Blaster Live! sound card running Windows 98). Each tester used the microphone headset bundled with the vendor's software.

The individual testers trained each product for the time the vendor recommended and then imported a series of documents into the program to enhance and build the vocabulary. They next dictated another set of similar documents into the program to measure the initial accuracy. They corrected these documents to enable the program to build its vocabulary. Then they dictated the same documents a second time to determine the final accuracy scores, which showed how much the program was able to learn from the process of dictation and correction. To measure throughput, each tester was timed dictating documents and correcting them using a combination of voice, a mouse, and minimal keyboard strokes. Having run these tests on the Pentium II-based NEC system, the testers repeated the procedure on the Pentium III-based Dell PC. —Analysis written by Diane Jecker

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SUCCESS

Keeping key documents safe and on the move Titus Grain Inspection, Inc.

As federally-licensed grain inspectors, Titus Grain Inspection, Inc. in West Lafayette, IN, works with farmers, grain elevators and a variety of food processing companies to ensure the quality of grain products bought and sold out of mid-Indiana. The company must conduct quality-control tests and submit particular kinds of documentation to buyers and government agencies.

Often paperwork sent by Titus upon completion of its inspections is a key requirement for payment to all involved. That's where WinFax PRO™ has made a big difference, since the company's headcount stands at just five people.

"We now fax the paperwork needed so the sellers can get their cash advance right away," explains Douglas Titus, assistant manager and computer specialist. "We used to overnight it, but faxing it means faster payment. And WinFax has saved us plenty of time because we can do it straight from the computer."

As more and more of Titus' communications are conducted by electronic mail and over the Internet, the firm has also come to depend on Norton AntiVirus™.

"I've been using Norton AntiVirus for a very long time and I like it better than any other anti-virus product on the market," says

Titus. And you know what? We've never had a problem with a virus."

The versatile Norton Utilities™ software has also helped the company

"We use a number of highly-specialized, custom-built programs and they sometimes have a tendency to crash our computers," Titus notes. "With CrashGuard™, we can minimize the effects of that and keep from having to reboot. CrashGuard can also help us figure out what's creating the conflict so we can prevent the problem from happening over and over again."

The disk optimizer in Norton Utilities is popular, too. "I use it almost every day, especially on our older systems where disk fragmentation can really slow down performance. And I like CleanSweep™ because we take a lot of documents off of FTP sites and our hard drives fill up fast. CleanSweep makes it easy to get rid of the stuff we don't need anymore. If I make a mistake and need to keep something I've dumped, it's easy to retrieve it."

"We had lightning damage that wiped out everything, even in the CMOS. But Norton Utilities was able to restore it and we were back up and running fast."

Ready for Year 2000

C.W. Cook Co.

Concerned about your system going down or losing data when the clock strikes midnight on December 31, 1999? With the imminent arrival of the Y2K bug, many savvy small business professionals are testing their systems proactively to prepare for the big day.

"Although we investigated different products, Norton 2000™ won hands down," says Claudia Cook, Information Systems Director for C.W. Cook Co., a busy, family-owned civil engineering, land surveying and land planning firm.

Norton 2000 audits applications against a database of known Year 2000 problems and gives a comprehensive report on its findings. It also tests

the system's BIOS, real-time clock, and system clock, fixing many of the problems it discovers.

"It was great because the reporting aspects are very specific. It takes you right to the line of code where the problem is and gives you a report. I can give that report to the director of the department and say 'We need to fix this problem.' With other products we had to trust that it fixed the problem, and I'm not into that," reports Cook.

"If Norton 2000 finds that there is a problem with the printer driver, for example," she says, "it takes you directly to that manufacturer's Web site where you can get a new driver. So, even if Norton 2000 can't fix something, it tells us about problems with other vendors' software and we'll contact them for a solution."

Maximum client contact for minimal cost

Capital Financial Services

"When I started this firm in 1995, we needed computer software that would help us develop and manage our client base," recalls J.C. Stadler, founding partner of New Jersey-based Capital Financial Services Corp. "I knew that personal contact with our clients was essential, but money was tight and I didn't want to spend a fortune on software."

According to Stadler, he found the solution he needed with ACT!™ software.

"ACT! gives us added flexibility and it works with both sides of our business. In one database, we can manage both our financial and accounting clients. Our whole marketing effort is centered around our ACT! database," he says.

For example, the firm uses ACT! to track when they mail an introductory letter to a new contact. They also schedule ACT! to remind them to follow-up on that contact two weeks after the letter goes out.

ACT! is also the company's scheduling software.

"The first thing our receptionist does every day is print out the schedule for the day, which includes any calls that need to be made, mailings to go out and any other to-do items."

"Another benefit with ACT! is how easily it integrates with Symantec's other products. Stadler likes to work from home two days a week. But, if a client calls, he wants to be available to them. In order to do this, he uses pcAnywhere™ from his home computer to access the ACT! database at the office and download any other files he needs. If he meets with a client, he takes notes on his laptop and, using WinFax PRO, faxes his notes into the office, where the receptionist inputs them into the ACT! database.

Of course, at the end of the day, the issue is still whether or not the clients are satisfied, and ACT! makes that happen.

It's no wonder then, that Stadler calls ACT! his firm's "most valuable asset."



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minimize your PC downtime

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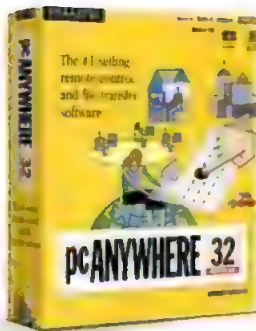
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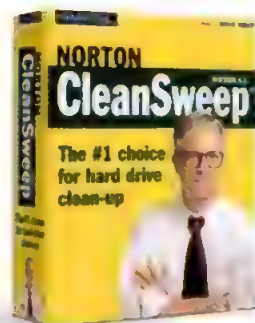
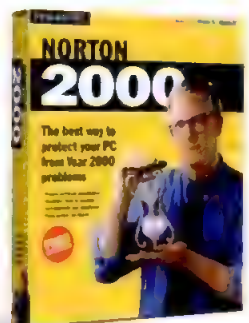
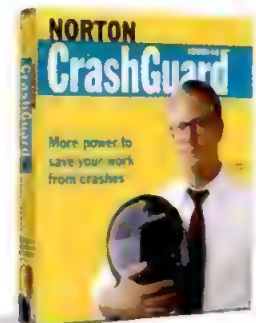
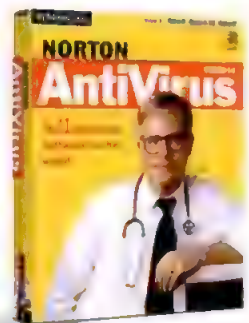
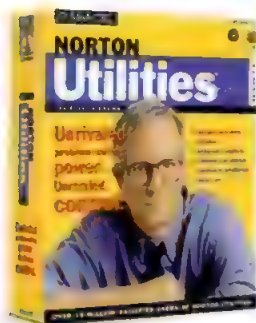
Norton 2000

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SUMMARY OF FEATURES

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Speech Recognition Software



	Dragon NaturallySpeaking Preferred 4	FreeSpeech 2000	L&H VoiceXpress Professional 4	ViaVoice Pro Millennium Edition
■ YES □ NO				
Street price	\$160	With SpeechMike, \$150; with Plantronics headset microphone, \$100	\$150	\$180
Included microphone headset	VXI Parrot Translator	Plantronics SR1	Telex USB Headworn Microphone	Andrea NC-61
Base active vocabulary/Maximum active vocabulary	160,000 / 250,000	60,000 / 670,000	34,000 / 64,000	64,000 / 2,000,000
Supports multiple users/dictionaries	■ ■	■ ■	■ □	■ ■
Modeless operation	■	□	■	■
Can play back dictation for proofreading	■	■	□	■
Can convert text to speech	■	■	■	■
Supports USB microphones	□	■	■	□
Transcribes from hand-held recorders	■	□	■	■
User can dictate into any Windows application	■	■	■	■
Command and control/natural-language command of:				
Windows desktop	■ □	■ ■	■ ■	■ ■
Corel WordPerfect	■ ■	■ ■	■ □	■ □
Microsoft Excel 97 and 2000	□ □	■ □	■ ■	■ ■
Lotus 1-2-3	□ □	□ □	■ □	■ □
Microsoft Outlook	■ ■	■ ■	■ ■	■ ■
Microsoft IE 4.0 and 5.0	■ ■	■ ■	■ ■	■ ■
Netscape 4.0	■ □	□ □	■ □	■ □
AOL	■ □	□ □	■ □	■ ■
Microsoft Exchange	□ □	■ ■	■ □	■ ■
Lotus Notes	■ □	□ □	■ □	■ □
Microsoft PowerPoint	■ □	■ ■	■ ■	■ □
Microsoft Project	■ □	■ ■	■ □	■ □
Microsoft Money	□ □	■ □	■ □	■ □
Quicken	□ □	■ ■	■ □	■ □
Supports command macros	■	■	■	■
Specialized dictionaries included	None	French, Italian	Business/Finance, In the News, Leisure, Technology	Business/Finance, Chatter's Jargon, Computer, Cuisine
Dictionaries supported within other versions	Medical, Legal	Radiology, Auto Claims Insurance, Property Claims Insurance	Medical, legal, police	Medical, legal
Can export user speech files	■	■	■	■
Can export user speech files	■*	■	■	■

* The user must call technical support for instructions and manually copy files. ** With free download.

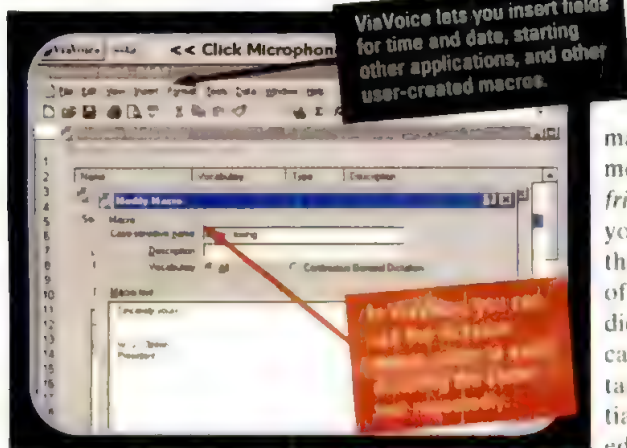
rallySpeaking also lets you say the names of links, but only ViaVoice numbers the items on the page, so you can just say the number of the item you want.

ViaVoice has the best macro capabilities of any program tested. In addition to macros that type text and keystrokes,

you can write macros that insert the date, for example, and that include user-defined lists (you could program a command such as "send e-mail message to *friend*," where *friend* is any name from a list you create). ViaVoice has the ability to save the audio of the last thousand words dictated for playback, which can help you correct mistakes. This feature is essential if you want to delegate editing to someone else.

Correcting mistakes in ViaVoice is cumbersome, however. The program's manual suggests using a combination of mouse, keyboard, and voice to edit, rather than using just voice commands. Also, you can't use common formatting commands in SpeakPad, ViaVoice's own simple word processor. In our testers' experience, commands such as "bold last three words" worked only within Microsoft Word.

ViaVoice's excellent accuracy scores are tempered by the program's limited correction capabilities. But those new to speech recognition, and power users who value the program's macro capabilities and ability to save audio for later playback, will find much to like about ViaVoice.—DN



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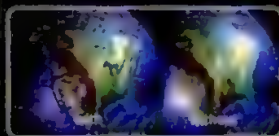
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Moore's Law is for wimps," proclaims Sanford Russell, product marketing manager for graphics chip company nVidia. Moore's Law refers to Gordon Moore, who suggested that semiconductor performance would double every 18 months. Moore was referring to CPUs, but for the past three years, the computational power of graphics chips has increased eightfold every 18 months. This pace clearly can't be sustained, but it signals a shift in the fault lines of the graphics business.

THE STATE OF GRAPHICS TODAY

All personal computers shipping today—to home users or businesses—have some

3-D capability. And even the most limited of these have far greater capabilities than those first consumer chips, which shipped in 1995.

On top of that, 2-D graphics for business uses have become infinitely fast; standard applications such as word processors and spreadsheets don't suffer from slow graphics performance. That's not as true for another graphics application more tuned to home than business use: video. By *video*, we mean television in the form of NTSC or PAL video. Translating analog video to the digital world of the PC is a serious performance challenge for the CPU and the graphics card. Video on the PC is perhaps more

important than 3-D graphics. Applications such as teleconferencing, in-house training, and interactive work aids need robust video capabilities. And on the home front, DVD playback is gradually becoming important.

Still, 3-D graphics capability has become a crucial buying criterion for home users, particularly gamers. And the use of 3-D graphics in entertainment applications has progressed from a few violent action games to a much broader range of strategy games and even children's titles.

Recently, a spate of new 3-D chips have appeared on the scene. To help you understand these developments more

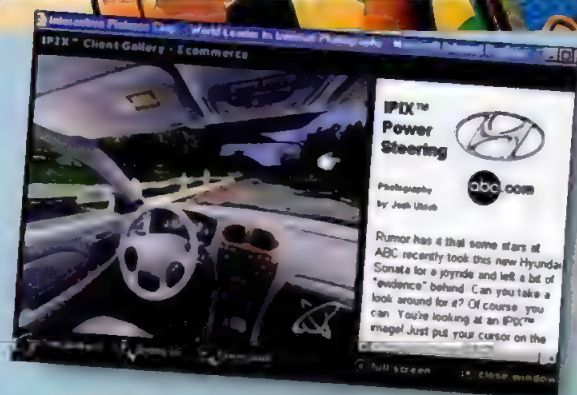
Home and Office Uses for 3-D Technology

There are numerous ways to use graphics cards—for business, entertainment, and gaming.



◀ GAMING

High-profile and in the spotlight, the gaming market is a huge force in the hardware industry. The newest games require the newest technologies, and brand-new games will often run on only two or three high-end chips, raising the bar for vendors. Higher fill rates, texture mapping, and hardware-based T&L technology will continue to allow innovation among developers.



▲ OFFICE

The 3-D office suite is still missing in action, but lots of technologies exist that deserve a good rendering. Apple's QuickTime VR, a common way to add 3-D elements to Web sites, lets you visit a virtual showroom such as the one shown above. Dual-monitor solutions, such as the Matrox Millenni-

um G400, are essential for Web designers, who can make changes to their HTML code on one monitor and see the results on a second. And videoconferencing technologies can make a distributed extranet a reality, letting Tokyo and Toledo connect face-to-face.

fully, we'll explore the components of some major 3-D chip sets. Afterward, we'll look at some other exciting developments on the graphics front.

3-D GRAPHICS TECHNOLOGIES

Before taking a look at individual features, we first have to understand the 3-D graphics pipeline. There are four components to the 3-D pipeline: transform, lighting, setup, and rendering.

Transforms consist of the mathematical calculations used to determine translation (movement), rotation, and other changes in objects. *Lighting* calculations determine how a scene and its various objects are illuminated. (When we speak of lighting in this context, we mean geometrically calculated light sources, not light maps, which are special texture maps that simulate lighting effects.) Texture coordinates are then assigned, and the objects are deconstructed into triangles and vertex data (vertices are the corners of polygons—typically triangles) and sent

to the setup engine. *Setup* is the process by which vertex data generated by the transform and lighting steps is translated into data formats suitable for pixel generation. The final step is *rendering*, in which pixels are actually created, properly shaded, and colored for display in the frame buffer. It's at this stage that the actual *texels* (texture elements) from the various textures are blended into the colors of the base object's pixels to create each pixel's final color.

SETUP AND RENDERING

Until recently, consumer-level 3-D accelerators handled only the setup and rendering steps. In some cases, setup was handled by the driver (and hence in software), whereas other cards had full floating-point setup engines on the chips themselves. Although setup is important, rendering is what creates the images we see on-screen.

All recent 3-D accelerators handle the basics of rendering. That is, they are capa-

ble of running nearly all of the 25 ZD 3D WinBench quality tests used to generate the WinMark score. All current chips can handle perspective-corrected texture mapping, multiple filtering modes, sophisticated texture blending for special effects, and effective-looking transparency. Certainly, some chips are faster than others, but their feature sets are quite similar. But despite this relative richness, rendering technology still has lots of room for improvement.

ANTI-ALIASING AND CINEMATIC EFFECTS

One of the holy grails of 3-D graphics technology has been full-scene, hardware-accelerated anti-aliasing. Spatial aliasing occurs when there is more information than the display device can handle. The result is commonly known as "the jaggies." These typically appear along the edges between polygons of different colors and are visible as a sort of stair step effect along diagonal lines. *Anti-aliasing* is a technique for blending adjacent pixels together to create a smoother appearance.

Another technique, developed by Silicon Graphics, is the use of *accumulation*

Our Contributors: LOYD CASE is a contributing editor of *Computer Gaming World*. Associate editor JENNIFER TRIVERIO and PC Magazine Labs hardware technical director NICK STAM were in charge of this story.

CHECK OUT THESE GAMES THAT TAKE ADVANTAGE OF NEW 3-D TECHNOLOGIES: BattleZone 2 Activision/Pendemic ■ Carmageddon 3 SCI/Torus ■ Descent 3 (patch)



◀ ENTERTAINMENT

Computer video has a great deal of potential, but the show's over before it begins without a good graphics card to render screens. From CNN broadcasts to DVD playback, there are numerous sources of video out there. But without specialized hardware support, even a 600-MHz Pentium III will drop frames. DVDs will look superb with a fast graphics card. Many companies offer special versions of their cards that support TV-out. Some cards will even support HDTV; read the specs carefully to find out what you're getting.

buffers, which are essentially special frame buffers that temporarily store rendered frames. After several buffers have been accumulated, the graphics chip blends them together to create a more pleasing image.

Now 3dfx has simplified the accumulation buffer and renamed it the *T-Buffer*, which is a new technology that is less flexible but much faster. The T-Buffer enables full-screen anti-aliasing in all Direct3D, OpenGL, and Glide applications. Because it uses a modified version of the accumulation buffer, the T-Buffer requires a high fill rate and memory bandwidth on the part of the hardware. (*Fill rate* is the speed at which rendered pixels can fill polygons.)

The T-Buffer enables some interesting cinematic effects as well. Two key effects that become possible are *depth of field* and *motion blur*. If you've looked through the viewfinder of a single-lens reflex camera you've experienced depth-of-field blur. If the lens aperture is

wide and you focus on nearby objects, distant ones appear blurry. Refocusing on the distant objects makes close ones blurry. Depth of field is used to great effect by cinematographers to draw people's attention to certain parts of a screen.

Motion blur is something that occurs when shooting film or video. Whenever a fast object, such as a speeding car, moves across the field of view or the camera is panned quickly, motion blur serves to smooth transitions between frames.

T-Buffer technology isn't perfect, however. For example, you can't have cinematic effects and anti-aliasing simultaneously. Also, anti-aliasing is "free" (programmers don't have to make any changes), but the same isn't true for the cinematic effects, which have to be hard-coded into the software.

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BUMP MAPPING

Bump mapping is another technique for improving the visual quality of a rendered image. Bump mapping is the application of a special texture (a bump

map) to an object in order to add more detail to its surface. Note that bump mapping is a visual illusion—no new geometry is actually created, and if you get close enough to a bump-mapped object, you can tell that it's just a flat texture. But at a high frame rate and from a distance, this technique can make objects look much more realistic.

A classic example illustrates the concept: Take an orange sphere and apply a bump map with a bunch of dimples. The net result is a realistic-looking fruit. There are several types of bump mapping, including *emboss*, *dot-product*, and *environment-mapped bump mapping* (EMBM). Emboss bump mapping is a relatively minimalist technique that blends textures together to achieve the desired effect of more realism. But the light source used to calculate a map is monochromatic, (unlike ordinary, polychromatic sunlight), limiting realism. On top of that, at extreme lighting angles, the embossed bump map looks completely unrealistic.

EMBM is one of the techniques used in DirectX 6.0 and later to simulate detail. Extreme lighting angles shining on surfaces still look correct, and lighting can be multicolored. Dot-product (also known as dot 3) bump mapping can also achieve very good results. Currently, only Matrox G400-based cards support EMBM. The nVidia GeForce 256 chip supports dot-product bump mapping, as does 3D Labs in its product line. The remaining chip sets support only emboss bump mapping.

TEXTURE COMPRESSION

Another technique for making objects look more realistic is to use higher-resolution textures. In today's titles, most textures are 256 by 256 pixels or smaller. Part of the reason is historical: Early 3-D accelerators supported only 256-by-256 as a maximum texture size. And texture space relative to memory bandwidth is a very real concern. A 256-by-256, 16-bit texture takes up about 128K of memory on a graphics card. A 1,024-by-1,024, 16-bit texture takes up 2 megabytes.

Game developers want to move to textures with 32-bit color depths. Because

T-BUFFER TECHNOLOGY



3dfx's T-Buffer technology enables some cool effects. On the left, ordinary screen shots. On the right, a race car showing full screen anti-aliasing, motion blur in action, and a depth-of-field effect.

most current and future games make heavy use of multitexturing and multipass rendering, visual errors can crop up when you blend multiple 16-bit textures. Using 32-bit textures alleviates the visual problem, but the space and bandwidth requirements increase rapidly. Even a 3-D accelerator with 32MB of video memory cannot adequately store textures for high-resolution, texture-rich animations.

The answer is texture compression. Compressing graphics is a well-understood technology, and textures are no more than bitmaps, which are easily compressed. Texture compression allevi-

ates another problem: bottlenecks induced by limited memory bandwidth. Quad-speed AGP is limited to a maximum throughput of 1GB per second, so moving large texture sets and lots of vertices across AGP can be a serious slowdown. In addition, the bandwidth on the video card itself can be a limiting factor at high resolutions. Texture compression relieves some bandwidth bottlenecks.

When S3 announced the original Savage3D chip, it also announced S3TC, a texture-compression scheme that was later adopted by Microsoft as part of the company's Direct3D API (known as

DXTC). S3TC is a simple scheme designed specifically to compress textures. S3 estimates that a 1,024-by-1,024, 32-bit texture that would otherwise take up 3MB of memory can instead fit into 524K of RAM—683K if the application is using MIP maps.

More recently, 3dfx has announced FXT1 texture compression. FXT1 is essentially a superset of S3TC, using three different texture schemes depending on the kind of textures used. What's unique about FXT1, however, isn't the technology itself but the price and the distribution method. 3dfx is giving FXT1 away, using the open source model for distribution.

TRANSFORM AND LIGHTING

Until very recently, all low-cost graphics cards handled only rendering chores. But with the recent shipment of nVidia's graphics processing unit (GPU)—the GeForce—and S3's upcoming Savage 2000 chip, a fundamental discontinuity has taken place in the graphics arena. Though rendering is certainly a computationally intensive task, there was a limit to what a fast renderer could achieve. Ultimately, you want more real detail in a scene, not just fake detail added by tricks such as bump mapping.

The only way to do that in the 3-D graphics world is by adding polygons. In mainstream PC 3-D graphics today, the CPU has been used to manipulate scene geometry comprised of polygons, as well as to calculate polygon vertex lighting. The problem has been that CPUs have been on a steady, relatively slow ramp. As Moore's Law suggests, the polygon count of a scene should double roughly every 18 months, hardly sufficient for today's gaming needs. Although technologies such as AMD's 3Dnow! and Intel's SSE (Streaming SIMD Extensions) can help in the matrix math used in transform and lighting (T&L) calculations, off-loading the CPU's 3-D graphics calculations to a dedicated transform and lighting accelerator allows for greater polygon counts.

What the new chips from nVidia and S3 allow is T&L calculations anywhere from three to ten times as fast as a 500-

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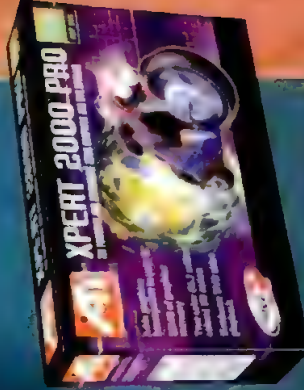
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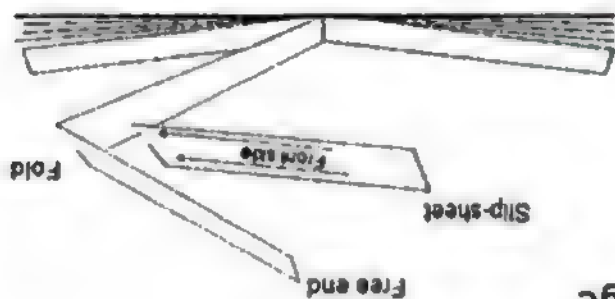
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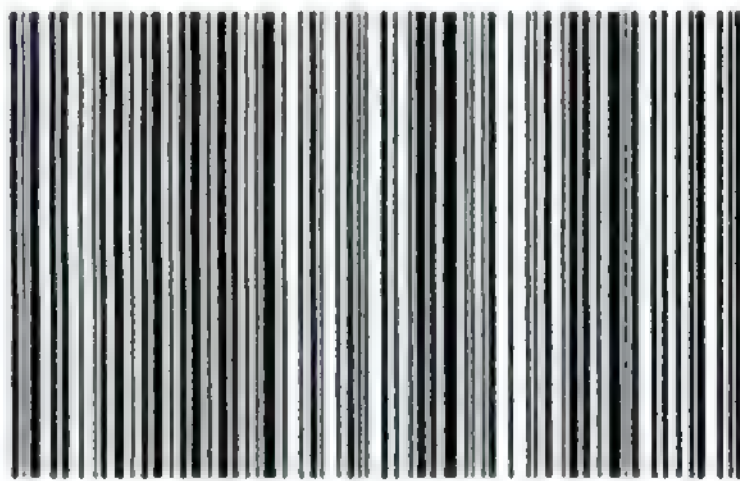
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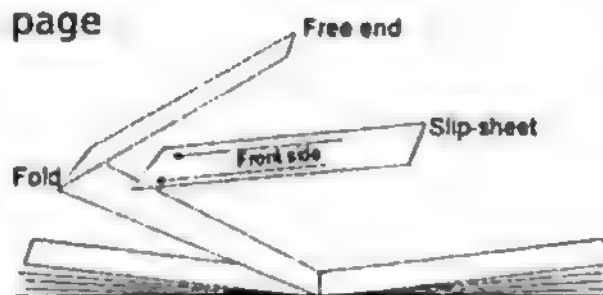
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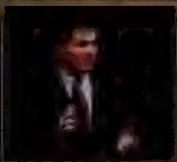
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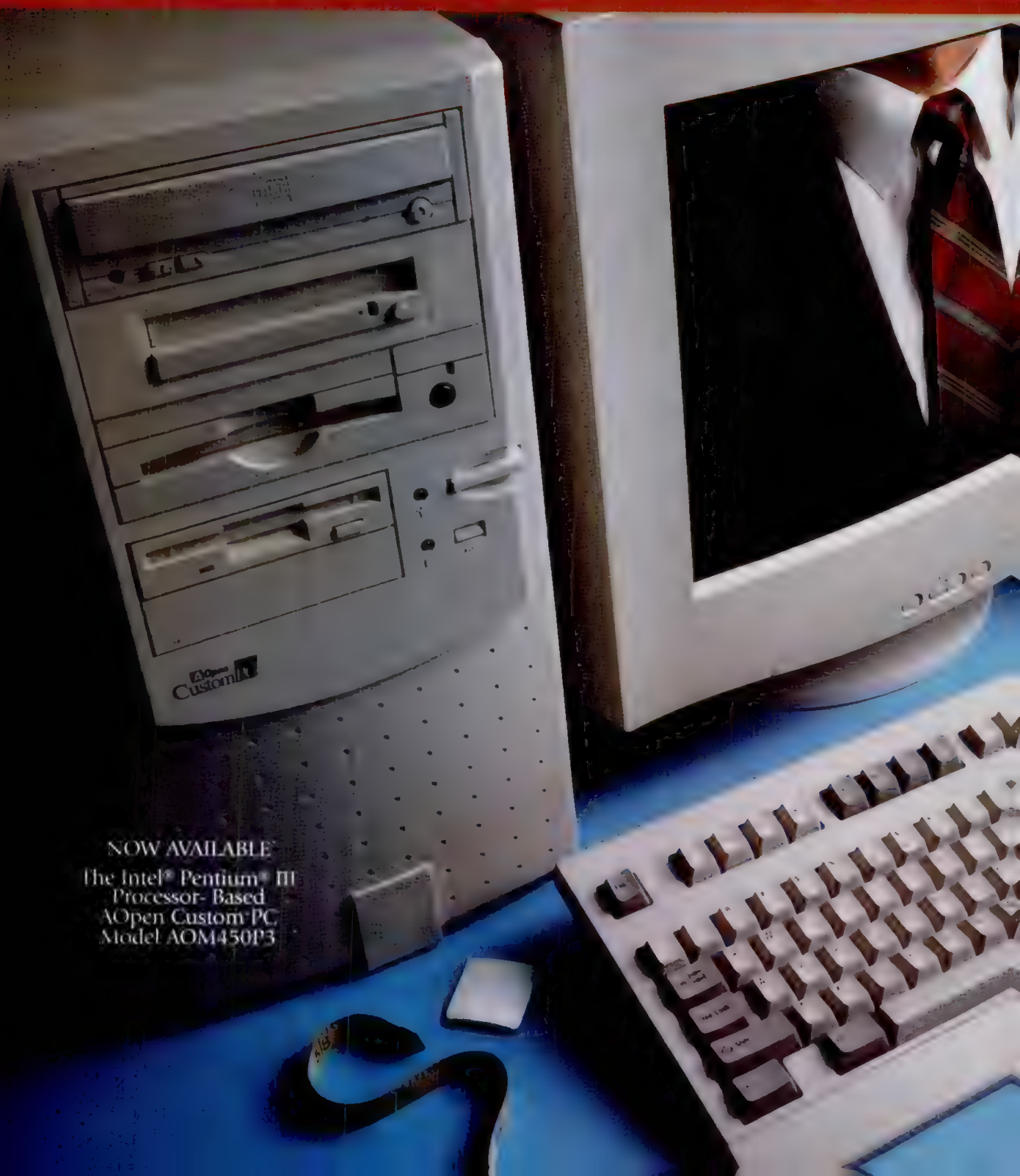
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Screenshot of Slave Zero courtesy of Accolade

*Requires Dolby Digital receiver



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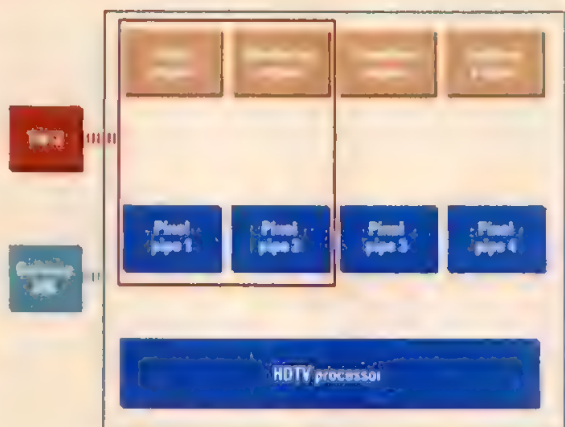
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HOW IT WORKS

nVidia GeForce 256

Last year's nVidia RIVA TNT2 chip handled only the setup and rendering stages, and it had only two graphics pipelines. The nVidia GeForce 256 has four independent pipes (through which rendered graphics are passed to the frame buffer), meaning that it can process twice as much information as the TNT2. The GeForce also integrates transform and lighting capabilities and HDTV processing.



MHz Pentium III. Given that the CPU always has to do other things, too, this translates to as much as a tenfold increase in polygon counts in a scene, though a more realistic number would be threefold to fivefold. A new title, such as id Software's *Quake III: Arena*, probably has 10,000 polygons in the most demanding scenes, so scenes with 30,000 to 50,000 polygons will be possible. The level of detail possible in a scene increases dramatically. People look more like people and less like something built with plastic building blocks.

APPLICATIONS IN A 3-D WORLD

All the new 3-D accelerators have tremendous computational horsepower under their hoods, power that is harnessed mostly for accelerating 3-D game titles. As we noted, 3-D graphics are becoming increasingly pervasive in all types of games, so it's not just about blasting everything in sight anymore.

But what about other applications? No killer 3-D business app has arrived on the scene yet, although there have been some interesting developments. One is the gradual trickle-down of professional 3-D modeling programs to more mainstream applications. Programs like Play's *Amorphium*, Newtek's *Aura*, and MetaCreations' *Bryce* and *Poser* all bring significant features sets and easier user interfaces to complex modeling and animation. Add-ons and plug-ins like

CrystalGraphics PowerPlugs series add 3-D spit-shine to PowerPoint presentations and Web pages.

On the other hand, mainstream 3-D business applications have been less than successful. Portola Dimensional Systems had some initial success with *Coronado*, a data visualization tool, but the company has been quiet lately. Various attempts at Web-based 3-D, including MetaCreations' *MetaStream*, have had mixed success. Applications such as interactive shopping and stadium seat selection are still evolving.

Some business applications could clearly benefit from better 3-D performance. Imagine an Excel chart that's animated to show change over time. Even simple texture-mapped animations could bring additional flash to usually dry topics. More important,

A scene from *Dagobah Moor Zoological Gardens*, a game designed to take advantage of T&L acceleration.



animated charts could highlight trends more sharply than trying to page through separate charts.

Interestingly, real-time 3-D game engines are beginning to have an effect on nongaming industries. Perilith Industrielle is creating an application called *Unrealty*, which uses Epic Software's Unreal game engine to create highly realistic "walkthroughs" of real estate sites. Since the Unreal engine has robust networking capabilities, house hunters could see highly detailed representations of property over the Internet—and these could be far more detailed than similar, browser-embedded attempts.

On the user interface front, Microsoft has been discussing GDI+, its next-generation user interface, which will incorporate advanced graphical elements such as compositing of windows and 3-D on the desktop. There are still a lot of challenges in developing a 3-D user interface, however, so GDI+ will probably take some time to become a reality. Once something like GDI+ arrives on the scene, 3-D capability will become a part of the operating system, opening up possibilities for mainstream applications as well.

THE FUTURE OF 2-D GRAPHICS

All the focus on 3-D overlooks the fact that most business applications and desktops are still firmly anchored in the 2-D world. Certainly, the vast majority of business applications are still Windows-based, and 3-D has mostly been used for graphical eye candy, such as 3-D titles for presentations and Web pages.

Future advances in PC displays could result in very high resolution, high-density displays—as high as 300 dpi. This would mean near-print-quality displays. If you couple that with 16-by-10-inch footprints expected for next-generation displays, applications such as publishing and image processing will be rejuvenated. The problem is that the current 2-D horsepower in today's graphics cards will be inadequate for such environments unless elements of 3-D



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technology are introduced. Toss in GDI+ effects, such as 2-D alpha blending (for transparency effects and anti-aliased text), compositing of windows, and anisotropic filtering, and you have a blending of 2-D and 3-D technologies. So while current 3-D hardware efforts may look like they're focused on games, all that will pay off in the long run with more useful graphics for business users.

PHILOSOPHICAL APPROACHES

The pace of change and the huge resource investments needed to develop modern graphics chips means that only a handful of companies are capable of mustering the resources needed to churn out new products. Each of these companies has a different approach and philosophy.

NVIDIA: SHEER FORCE

After the failure of its first chip, the NV1, nVidia came dangerously close to corporate demise. To survive, the company decided to focus solely on graphics, make its schedules, and not sacrifice performance, as it did in the NV1. Since then the company has been on a roll, shipping the RIVA 128, RIVA 128ZX, TNT, TNT2, and GeForce 256.

Since the RIVA 128, nVidia has basically adopted a brute-force approach to 3-D graphics. This philosophy is exhibited in the new nVidia GeForce 256 GPU. The GeForce has four complete pixel pipelines, a hardware transform and light-



nVidia's GeForce 256 allows for a very high polygon count, which enhances realism.

ing engine, and the capability to handle HDTV-class video. The chip itself is large (121-mm square) and sports 23 million transistors—roughly equivalent to the transistor count in the AMD Athlon CPU. nVidia also worked with memory manufacturers to be the first to market with DDR (double data rate) SDRAM on its graphics cards. DDR SDRAM has roughly twice the throughput of standard SDRAM at the same clock rate. This effectively doubles the memory bandwidth of GeForce 256 boards, again implementing a purely brute-force approach to the problem. There's nothing inherently wrong with this method, as long as nVidia can keep delivering. This approach has yielded excellent performance results in the past and seems to be paying off in the company's new products as well.

3DFX: FILL RATE IS KING

3dfx has just announced a graphics card with the highest fill rate ever. It claims the new high-end card will be capable of a 1-gigapixel fill rate—one billion pixels per second. Point of fact: The next product line from 3dfx will need a high fill

rate to take advantage of new T-Buffer features. 3dfx has a very loyal following among its users, but the company has failed to deliver anything new since the Voodoo3's release in early 1999. Though the next-generation 3dfx product will have an extraordinarily high fill rate, the card won't have T&L acceleration, which will make it ideal for current generation and older titles but not for upcoming, high-polygon-count titles. The company has stepped up to the plate with full 32-bit capability, hardware texture compression, and full scene anti-aliasing courtesy of the T-Buffer.

On the other hand, the Voodoo3 product line has been the price and performance leader for the last few months. Although capable of only 16-bit rendering, it's very speedy at that, and Voodoo3 boards are quite inexpensive. Some of this is because the chip itself only has 16MB of RAM, and recent RAM prices have played in its favor.

What remains to be seen is whether 3dfx can recapture some of its past glory. The company has a strong, dedicated engineering team, cash in the bank, and a lot of good will among users, so declaring the company out of the running would be premature by any standard. If the company can ship the Voodoo4 on time and follow up with a next-generation product shortly afterward, then 3dfx will most certainly rebound.

S3: PRICE AND PERFORMANCE

Every successful graphics chip company seemingly goes through a near-death experience, and for S3, it was the

HOW IT WORKS

3dfx T-Buffer

The newly developed T-Buffer holds multiple rendered frames before they are displayed on your monitor. (An ordinary graphics chip stores only one image in its frame buffer, swapping that screen with the one that is currently being displayed.) When enough screens are stored up, the T-Buffer blends them together to eliminate the jagged edges that can sometimes appear. The new image is then rendered on-screen.

PC graphics accelerator



T-Buffer



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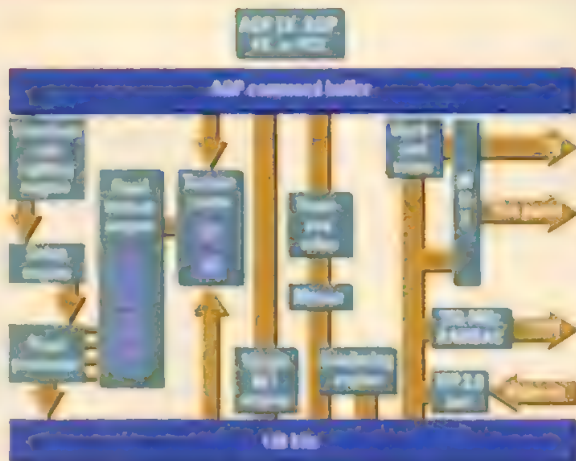
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HOW IT WORKS

S3 Savage 2000

The S3 Savage 2000 adds a transform and lighting engine. Though it has just two pixel pipelines, the chip can perform dual texturing on both pipelines in a single clock cycle. The Savage 2000 also has a two-stage texture cache. Compressed textures are loaded into the second-level cache, then decompressed into the first-level cache for use by the chip.



ViRGE. Once king of the Windows accelerator market, S3 has taken several tries to get its 3-D act in order. One of the first consumer 3-D products on the market, the ViRGE actually slowed down many games when acceleration was turned on. Last year, S3 redeemed itself somewhat with the Savage3D, but the vendor still trailed the pack by a

pixel pipelines). The transform and lighting unit is probably less capable—even according to S3—than the nVidia GeForce 256's, but it still has at least three times the polygon performance of a 500-MHz Pentium III. Toss in lighting and it's even faster.

More important, S3 went back to the drawing board and pumped up the Savage 2000's fill rate. The

first version of the product can pump out 640 megatexels per second; the Savage 2000+ will output at least 800 mega-

texels per second at a 200-MHz clock speed. High clock rates are possible despite a transistor count in excess of 13 million, because the Savage 2000 is made using a 0.18-micron manufacturing process. This results in a smaller die size that runs cooler at high frequencies and offers better price and performance rates, because the chip costs less to manufacture.

In addition to capable 2-D and 3-D, the S3 Savage 2000 has improved acceleration for digital video, including HDTV. The hardware also has a flexible video-scaling scheme that allows software developers to use the best scaling for the video stream at any given time.

ATI: LAGGING THE CURVE

ATI has traditionally focused on the mainstream, low-cost manufacturer side

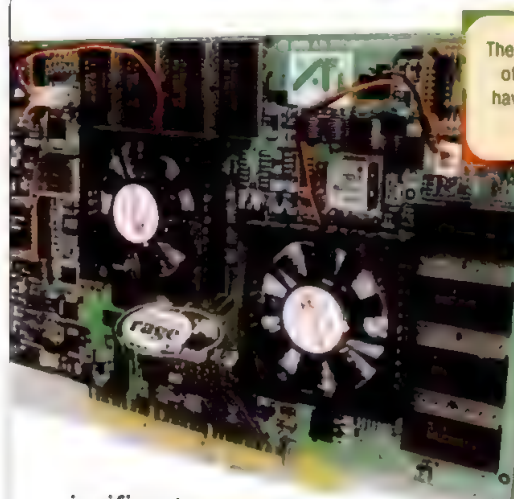
of the business. You can find ATI chips in many sub-\$1,000 PCs and all Apple computers. The 3-D performance of the current Rage 128 Pro, for example, hasn't caught up with nVidia's TNT2 line yet. ATI has excelled in low-cost manufacturing, video, and mobile platforms. You'll have difficulty finding a premium laptop without an ATI Mobility chip inside. On the video side, the ATI All-in-Wonder line, incorporating TV tuner and video-capture capability, has done well.

ATI is following up with the All-in-Wonder 128 Pro, a 32MB card with the Rage 128 Pro and Rage Theater chip for better TV image quality. The card is also capable of up to 720-by-480 MPEG-2 capture. And you can actually edit the MPEG-2 stream with the supplied video-editing package, a first at this price point; MPEG-2 video is difficult to edit, because it often drops frames.

ATI seems to have been bitten by the performance bug, however. The first evidence of this is the company's new board, code-named Aurora. There are two Rage 128 Pro accelerator chips on a single AGP card, each with its own dedicated 32MB of RAM. Each graphics chip renders every other frame, a feature ATI has dubbed AFR, for alternate-frame rendering. Aurora is capable of 520 megatexels per second. This is more efficient than the scan-line interlacing (SLI) technology 3dfx pioneered with its Voodoo2 line, because both ATI chips work independently. With SLI, each card needs its own copy of all the textures, but with AFR, each chip works with the set of textures needed for its own frame. In addition, each chip takes care of its own triangle setup. The result is a graphics card that barely slows down in 32-bit mode.

MATROX: CONSERVATIVE CHOICES

Matrox has always taken a somewhat conservative approach to its 3-D technology. This was evident with the original Matrox Mystique, which lacked bilinear filtering and alpha blending, and the G200 chip, which handled only five levels of MIP mapping. Matrox's performance has always trailed the leaders somewhat, but the Montreal company



significant margin. Earlier this year it launched the Savage4 and closed the gap somewhat—but mostly just treaded water relative to the competition.

The Savage 2000 looks to redeem S3's reputation. The first version, clocking at 160 MHz, should be shipping as you read this. At this speed the fill rate is roughly 320 megapixels, or 640 megatexels, per second (the Savage 2000 supports two textures per clock for each of the two

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has also managed to keep within striking range of the competition. The G400 chip supports multitexturing and environmental bump mapping but seems to have a fairly low fill rate.

On the other hand, Matrox has very strong video-capture and editing products, and this expertise is evident in the new Marvel G400. It's the only consumer-level card capable of hardware-based capture of motion JPEG video, so you rarely see a dropped frame, even on a slow CPU. Matrox has also always been attuned to the needs of business users. Matrox's dual-head support, which lets you use two monitors simultaneously, is very useful for business applications and appears in both the Marvel and in the standard Millennium lines. With Web browsers running nearly all the time in some cases, having a second monitor for other applications is pretty compelling. Other potential applications for dual-head include financial analyst workstations, desktop publishing, Web page design and graphics content creation—not to forget certain games that could benefit from wider fields of view.

THE FUTURE IS MULTIDIMENSIONAL

We live in a 3-D world, so it's natural that we'd want to have a 3-D world appearing on our PCs. Although the driving force for 3-D on the PC today is entertainment applications—read games—the pervasiveness of 3-D accelerators on personal computers of every class means that 3-D graphics will become the norm. In addition, new graphics cards are picking up increasingly sophisticated video capabilities. One day, we'll no longer be talking about the convergence of new and old media, we'll just be talking about media—whether on DVD, broadcast, cable, or the Internet.

Despite fierce competition and differing philosophies, all graphics chip companies share this vision. You can see the vision coming to fruition on console game and PC systems; business applications will eventually follow as 3-D graphics become part of the OS. Within two years, we'll see graphics chips with 50 million transistors. That horsepower won't remain untapped for long. 

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BY BILL MACHRONE

Stephen Covey has 7 habits of highly effective people. *The Music Man* has 76 trombones in the big parade, and Paul Simon says there are 50 ways to leave your lover. And although no one has written a song about it, there are 21 things you need to know about finding a good Web host.

WE'VE TESTED WEB SERVER HARDWARE AND SOFTWARE for years, but increasingly, companies are choosing to out-source the server aspect of their Web presence. The temptation to run your own server can be strong. You have total control. You configure things the way you like them. Most of the software is available free, and you don't need to spend a fortune on hardware.



Do-it-yourself

You maintain your own server and Internet connection at your site.

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Cons: Labor-intensive; requires technical expertise; high costs for equipment, direct Internet connection, and more.

Advanced Web Creations Inc.220
Concentric Network Corp.226

EarthLink Network Inc.230
HostPro230

Interland230
MindSpring Enterprises Inc.232



2 Shared hosting

Your site resides in the same server as several other sites.

Pros: Low cost, little maintenance, possibly better connection.

Cons: Less control, possible delays in making changes, possible performance problems, possible security problems.

3 Dedicated hosting

The Web host provides a server for your site alone.

Pros: More control, more software options, more configuration options, good connection.

Cons: Higher software and maintenance costs, fewer hardware options.

4 Colocation hosting

A server you own is housed at the Web host's site.

Pros: Full control, which may include security; unobstructed access to Internet connection, climate control, and power backup.

Cons: Increased maintenance costs, possibly including security expertise; increased server and software costs; no easy access.

Editors' Choice

• Interland



Your Web site deserves a good home. That means hosting it somewhere that gives you room to grow, capable admin-

istration tools, reliable performance, and responsive 24-hour, 7-day customer service. The Web host that comes closest to meeting our ideal is Interland, and accordingly we award it our Editors' Choice.

Interland's basic Windows NT hosting (\$19.95 per month) offers unlimited e-mail accounts and 5GB of data transfer each

month, giving you plenty of opportunity to develop a well-trafficked site at a small cost. Interland is also one of the few hosts to offer database (Microsoft Access) support on its basic service plan, and you can upgrade to Microsoft SQL without a dramatic increase in price.

Administration of the site is easy once you learn your way around the control panel; you can configure almost anything related to your site using it. Interland also sends you a printed manual with your sign-up to help you learn your service options and reduce the need for tech-support calls, which are available 24 hours, 7 days. We even had a minor setup problem resolved over a holiday weekend.

But you have to ask yourself what business you're in—how much time you want to devote to content and how much to technical issues. Then consider how much it costs to maintain a persistent connection from your machine to the Internet, keeping in mind that DSL and cable modem service providers usually prohibit hosting or other high-volume activities. Throw in site security, data backup, power backup, and redundancy and things get complicated rather quickly.

Web hosting is an outsourced service that will take care of all those details for a monthly fee. Many Web hosts began as Internet service providers for consumers or businesses and have extended their offerings to include business-oriented site hosting.

Using a Web host can be a vital part of projecting a professional image, especially for a small company. Your Web host will help you secure a domain name, which you generally can't apply to individual-oriented ISP accounts or free Web hosting sites such as Yahoo! GeoCities. Web hosts are also more attuned to the performance issues business sites will face, such as serving up large numbers of pages or navigating complex sites.

In this rapidly growing market, you'll need to do some sharp

shopping to get the relationship and the services you need. We looked at eight hosts' services that cater to small, growing Web sites, chosen for their name recognition, the high number of domains they register with InterNIC, and their generally good reputations. We reviewed them from contract to domain registration, from initial FTP to final performance test. There are hundreds of hosts to choose from. Let our experiences help guide you through the process.

1. Think about tomorrow as well as today. As your site grows in complexity, it may require server-side scripting, database support, e-commerce, or sufficient bandwidth to allow audio and video streaming. You won't find that kind of support at free hosting sites. It's important that you realistically assess not only your site's current needs but its future needs as well.

2. Remember security issues. A Web host provides a great deal of insulation from the everyday denial-of-service attacks and other hacks and cracks to which your server will be subjected. Do you really want to spend time every day reviewing server logs, updating software, and undoing whatever damage is caused by the occasional breach of your defenses?

3. Decide which type of hosting is best for you. The first level of service from a Web host puts your site among a number of others on a single machine, in a virtual domain that points at your site's location in the machine. This is known as shared hosting and is how we tested the eight Web hosts featured in this story.

As your site grows—or as it moves from static pages to interactive ones—it should probably move to a machine with more resources and fewer sites competing for those resources. The next step up is a dedicated machine at your host's site. The host owns, maintains, and backs up the server and provides all of the physical site security, power backup, and other aspects of running a data center.

The highest service offering in Web hosting is colocation of a server. In this case, you own the hardware box, but it's physically located in the host's facility to take advantage of the physical plant. You choose the bandwidth you'll need, and the host gives you a clear pipe to the Internet. This is a potentially attractive option, but for most hosts it means that you make your own security and firewall provisions; you're not protected by the host's firewall. Unless you're expert in security matters, you'll want to contract with the host or a securi-

ty consultant for proper protection of your site and server.

4. Demand prompt service and performance. Your site's popularity and success are affected by your Web host's level of service. A site that's slow because of overburdened servers will send your audience elsewhere. A site that's hard to maintain will always be a little behind the curve or will make you work harder to do the things you need to do. For example, you may want to set up a special e-mail box for a promotion or a contest. A few quick entries in an HTML page or a table of valid mail accounts should be all you need, but if you have to wait for your host's tech-services staff to do the job, you could lose your window of opportunity.

5. Match your apps to your hosting level. Some applications and kinds of sites are very difficult for the hosting service. If a service is built around a huge disk farm and a few reasonably fast machines, it's probably adequate for serving up large numbers of static pages. But a site that makes greater demands on the CPU will run slower in such an environment and, worse, will slow all of the other sites as well. Discussion forums are particularly demanding on host machines, because they need lots of memory

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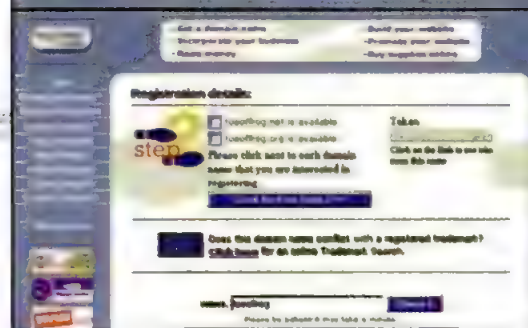
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THE DOMAIN NAME GAME

Your business's domain name is its virtual shingle, so you need a name that people will easily recognize and remember. But getting a customized address is more complicated than just signing a dotted line.

First, choose a domain name and find out whether it is still available. Registration sites generally offer a quick and easy search tool into the **Whois.Net** database (www.whois.net) to let you suss out the situation before you proceed. If, say, *yourbusinessname.com* is already taken, the search tool will often suggest alternatives.

Even if the domain name that you want is available, you need to make sure that you won't be in violation of federal or state trademark laws. Make sure that your domain name does not create confusion in the marketplace, either online with a similar-sounding URL or in the real world with a business that has a strong trademark already.

NameProtect.com (www.nameprotect.com)

lets you search both the Whois database and the federal trademark registry for existing business, product, or domain names—and even slogans—that may be confusingly similar to what you'd like to register. For \$35 per hour of online search time, you get a detailed chart showing any potential conflicts.

You can also search the **USPTO Web Trademark Database** (www.uspto.gov/tmdb/index.html) for potential conflicts before ponying up for a domain name, although you will not get the rough matches that NameProtect.com promises. If you don't yet have a trademark for your business or product name, you may want to do a full **Thomson & Thomson** search of federal, state, European, and common-law instances of your proposed name or phrase (www.thomson-thomson.com). Rates range from as low as 25 cents per hit, for trademark searches, to \$185 for 100 results from the European records.

Even if you already have a trademark on

whatever you're looking to attach a .com to, these searches are still important to identify cybersquatters. These are people who register domain names that are already established corporate names with the hope of selling them back for big money. In August, the **Internet Corporation for Assigned Names and Numbers** (www.icann.com), which is handling the transition to an open-market domain registration system, proposed a policy that would require mandatory arbitration for competing claims over domain names; under the plan, the loser would have to pay the legal fees.

Once you've cleared your name, so to speak, you can now go to **Register.com** (www.register.com) or your Web host to register it. Then focus on building up your site and your Web presence.—David Kushner

and fast access to their discussion databases. If you plan a large, active discussion forum, find a vendor that knows how to host them.

Your dream site may make other special demands on a host. Streaming audio and video require fast connections to the backbone, lots of aggressively priced disk storage, and robust servers with the appropriate software. Experience counts in hosting multimedia as well, so you should seek out a Web host with expertise in offering streaming media that will make the tools conveniently available to you.

6. Choose your operating system. Let your applications be your guide; run them on the operating system that runs them best. A Web host that offers both Microsoft Windows and Unix will be objective in its advice. Don't assume that you need Windows NT to run your site with FrontPage extensions. At least one host, **EasyStreet Online Services** (www.easystreet.com), has had great success rewriting the

extensions to run better on Unix than on Windows NT.

7. Read the fine print. We spent a lot of time making sure we understood the terms and conditions of each of the service providers we signed up with. You should do the same. Have a business lawyer review the terms. Never assume that a phrase that's in the agreement won't be enforced or somehow doesn't apply to you; it does. Be especially mindful of copyright ownership, response to complaints about your site, the service agreement's duration, notification regarding renewal or discontinuation, additional fees, and prevailing law.

8. Know how to handle complaints up front. The complaints issue is important. If someone complains that your site sends spam or contains pornography (regardless of the claim's validity), many providers will sim-

ply pull the plug. Find out what your recourse is. If there are unacceptable terms in the agreement and the provider is unwilling to change them, find a different provider. Remember that the agreement is there to protect both of you, and make sure that your interests are adequately represented.

9. Check references. Before you commit your precious site to a host, ask for the names of Webmasters who run sites like yours. Call them or e-mail them, but by all means get feedback. Browse their sites. Note the response times at peak and off-peak hours. Make sure that the performance is acceptable to you.

10. Snoop a little. Use Web-based tools to find out whom you're dealing with. Query the Whois database (www.whois.net) to find out who owns the site. Make a note of the business address. Run Traceroute

(available through most download sites) to view the path to the machines listed in the Whois search. If Traceroute finds the site through another ISP's server in the same domain, you may be dealing with a reseller rather than the actual hosting service. For example, **CIHost**, a host with a flair for self-promotion, appears to get its network access from **Propagation.net**, which in turn is served by megaprovider **BBN Planet**.

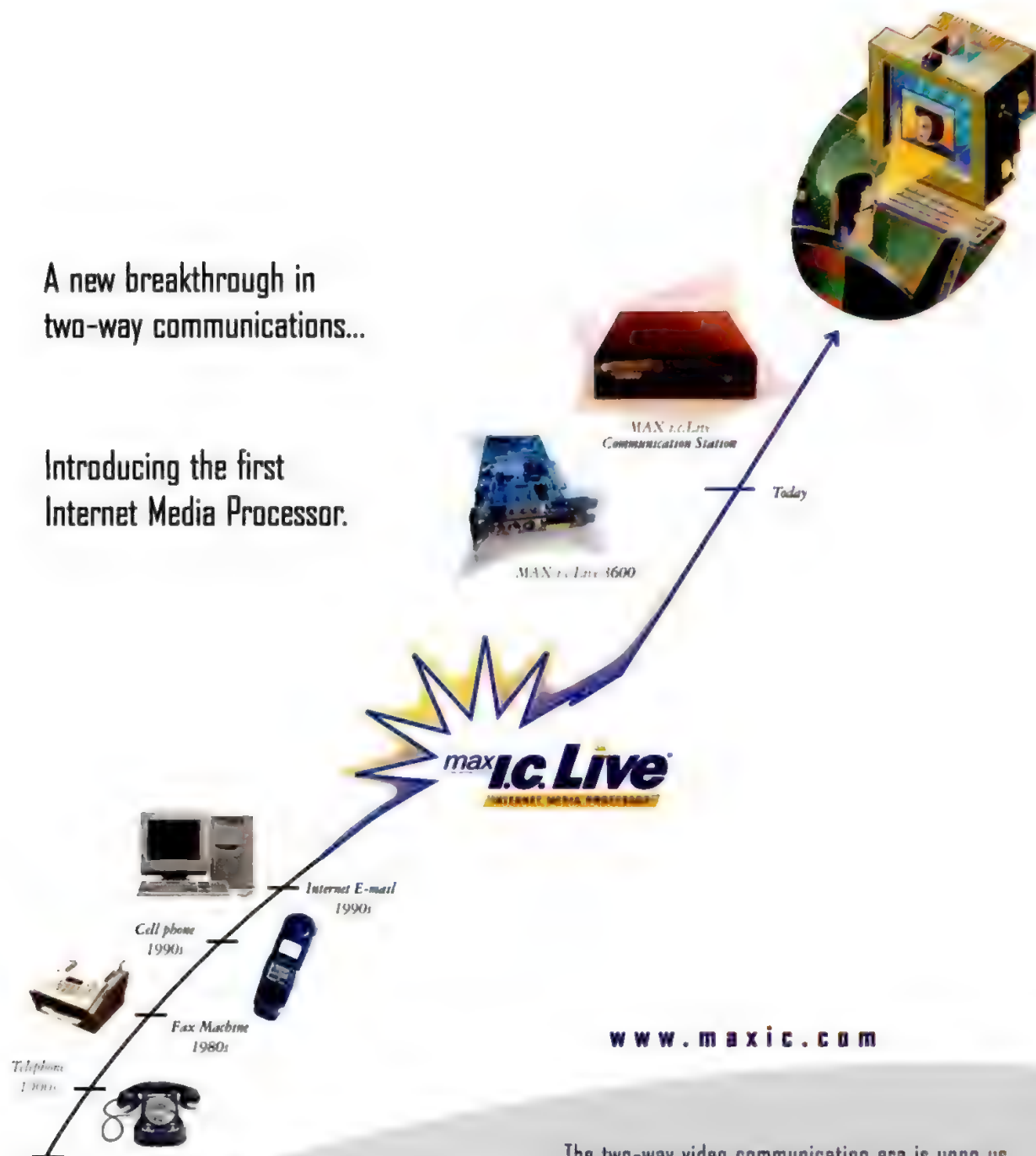
Using the Whois database, look up the machine one hop up from the end. Enter the names you come up with into a **Deja.com** search. In this instance, we found that **Propagation.net** has been associated with spam sites, and **CIHost** has prompted negative comments in the *alt.www.webmaster* newsgroup. Compare this with, say, a **Verio.net** trace.

11. Ignore the "professional" associations. And most of the ratings

Our Contributors: **BILL MACHRONE** is a contributing editor and vice president of technology for Ziff-Davis Publishing, and **LARRY J. SELTZER** is a frequent contributor to *PC Magazine*. **DAVID KUSHNER** is a freelance writer. Senior associate editor **DAVID LISKY** and *PC Magazine* Labs senior project leader **JAY MUNRO** were in charge of this story.

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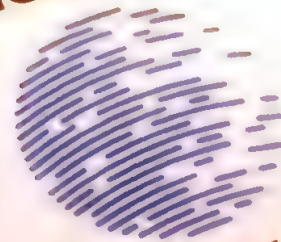
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sites. The members of the Web Hosting Guild include highly regarded companies and some held in generally low esteem among Webmasters. Ratings sites often aggregate outdated positive ratings from Webmasters who subsequently left a hosting service, usually for negative reasons.

12. Read what Webmasters are saying. Look at the *alt.www.webmasters* newsgroup, *www.hostinvestigator.com*, *www.scriptkeeper.com/cgi-bin/Ultimate.cgi*, and *www.hostcompare.com*. It may take a while to digest all the opinions and offerings, but the investment is well worth your while.

13. Know your audience. The more you know about the volume your users are likely to create, the better you'll be able to estimate your costs and pick an appropriate pricing scheme. If you're already hosting a site, study your log files and any traffic analysis tools to understand how much bandwidth and server resources you need, and choose accordingly as you move to your new host. If you're new to running a Web site, use your trial period to do the same, and make any necessary adjustments in your plan before your money-back guarantee expires.

14. Choose a plan you can afford. Steeply shelved pricing plans may put unanticipated financial burdens on your site. Some hosts skew their plans toward many small sites, while others are ori-

ented toward fewer, higher-volume sites. Exceeding the monthly cap on bytes served costs money, and the jump may be dramatic. A little success is sometimes the small site's worst enemy, because income for advertising-driven sites doesn't jump accordingly unless your advertisers are paying on a per-view basis. By contrast, a big increase in hits on an e-commerce site probably means more orders or a flurry of interest in a new product. In either case, revenues should go up accordingly.

15. Start slow before committing. Charges are often quoted monthly, then billed in larger increments. But discovering this usually requires human contact, not just a visit to the site. We think it makes sense to start with a short service term, perhaps 90 days, to make sure everything is working out as you planned. When you're happy, extend the term to receive the attendant discounts.

16. Watch the billing. We signed up for 9NetAve's 30-day trial and were promptly billed for a year's service. When we complained, the company offered to cut the billing period to six months, then three. Instead we invoked the money-back guarantee. It took one more phone call to recover our money, and we decided not to review the host.

17. Have an exit strategy. Despite the best intentions, relationships

sometimes go wrong. Or you may outgrow your Web host for any number of reasons. Some of the nicest people we know have become the customers from hell to their Web hosts, and some highly recommended hosts have turned out to be chambers of horrors to their clients.

18. Back everything up. Of course your HTML pages are backed up, because you create them locally and upload them to your host's site. Think instead about all the other files that are stored on your server: user logs, product databases, customer orders, discussion databases, server-side scripts, commercial software such as e-commerce and discussion forum packages, traffic analysis software, and almost anything else that you uploaded to the host site or your service loaded for you.

19. Ease your site's transition. If you realize you've outgrown your host, chances are the host has realized it too, and will usually work with your new host to transfer your site with minimal hassle and breakage. Most times the parting is amicable. But for those times when it isn't, be ready with local copies of everything you can think of.

20. Own your domain. Even if you're not planning to leave your host, make sure you own your domain name. If your Web host registered it for you, query Whois to ensure that you or

someone in your company is the registrant and administrative contact for your site. If your host is listed as both the administrative and technical contact, it owns the domain, not you, and you'll probably have to buy the name. Do this when your Web host is not angry with you, or your name could be held for ransom.

21. Help your visitors find your new home. Perhaps the biggest reason to leave your Web host on good terms is so that your old site can point to your new site for some period of time. Your users or customers will probably have bookmarked the URL, not the IP address, of the site or pages they use. But it can take several days, even a week, for the new IP address to propagate through the Internet's name servers. And if for some reason, users are pointed toward the old IP address, it's good to have pointers to the new site and instructions to update their bookmarks. Don't forget to e-mail your customers and put information on your pages that warns users about the impending change.

Web hosting is still a new business, one that continues to reinvent itself. You'll have to be prepared for constant change, incremental improvement, and the occasional quantum leap in service, cost-effectiveness, or performance. Don't be fickle, but continue to evaluate the service you're getting and what it's costing you.

All reviews by Larry J. Seltzer

Advanced Web Creations

Advanced Web Creations Inc.; 800-248-0151, 973-808-5585;
www.awc.com.

● If your Web site's needs are simple and you don't expect them to grow, Advanced Web Creations (AWC) could be a viable solution for you. Its Site Manager is easy to use, but we had some problems getting settled in and found better deals elsewhere.

We had no trouble with the secure online sign-up page, but AWC took its time activating our site. After signing up, we received an e-mail stating that within 48 hours we would receive a more detailed follow-up e-mail with information on how we could set up our site. Two days later fell on a holiday weekend, and when we called up to see where our site was, tech support didn't pick up.

AWC's tech and customer support is

closed on Sundays and holidays and closes at 10:00 on weeknights. Web2010 is the only other service reviewed that doesn't offer 24-hour, 7-day support.

The Site Manager page has easy links to most common administrative functions, such as changing passwords and monitoring resource utilization. You can also easily add scripts to your site from this page. AWC, like many other services, provides canned CGI scripts, but it doesn't install

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BENCHMARK TESTS

Web Hosting



The more time it takes to access your business's Web site, the more likely you are to lose customers. Our tests showed generally acceptable connect times, but some hosts experienced mildly worrisome spikes.

A closer look, however, reveals important differences that may influence which hosting provider you choose. As the charts for the Web hosts illustrate, connection times on the Web are never constant, though as you can see, some hosting services are more stable than others. Ultimately, as long as a Web host at its best can provide a level of service that meets your needs, it is the general consistency of its performance over time you'll need to consider.

In conjunction with Service Metrics, a company that measures Web performance, we tested connection times for each of our test sites from 21 locations around the country, three times an hour for two weeks. Each of the eight Web hosts we tested averaged under 3 seconds to connect over our testing period, a reasonable number. Looking deeper, though, we witnessed hourly average connect times that ranged from 0.8 seconds to more than 30 seconds. Both of those extremes occurred in testing the same vendor: Interland.

We contacted Interland to discuss the erratic behavior and ultimate outage we initially observed. We discovered that during our testing period our test site shared the Web server with a site that was dynamically serving pages using Active Server Pages

from a large Microsoft Access database. This competing site consumed large quantities of system resources, adversely affecting our site's performance. Once Interland identified the situation, it contacted the offending site and moved it to a higher service plan, after which the performance of our test site normalized.

As expected, our connection times fluctuated on a cyclical basis with the ebb and flow of daily traffic. We thought we'd see increases in access times during the evening hours when the number of Internet users online reaches its daily peak, but we observed that Internet traffic was most pronounced in the middle of the business day. Advanced Web Creations (AWC), EarthLink, HostPro, and MindSpring had connection times averaging 7 to 9 seconds at midday instead of the more typical 3 seconds or less the rest of the time.

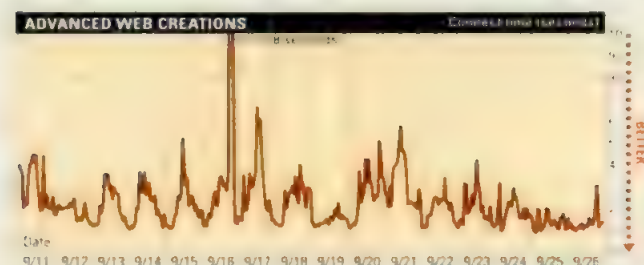
How We Tested

We used a combination of research and hands-on experience to evaluate the eight Web hosting providers in our story. To review as typical an experience as possible, we had an author pose as the proprietor of a Web consulting company called Toe of Frog Consulting and had him order comparable offerings from each Web host. He purchased the accounts under his own name, hiding his association with PC Magazine Labs until testing had been completed.

The test sites each consisted of a main page, a links page, an informational page, a multimedia page (created using Macromedia Flash 3), and several forms that used each service's form-to-mail script. We kept the sites simple because we were testing the low-end, shared hosting service of each Web host and we felt that the important experiences of sign-up, administration, and dealing with customer service would be representative no matter which service plan we selected.

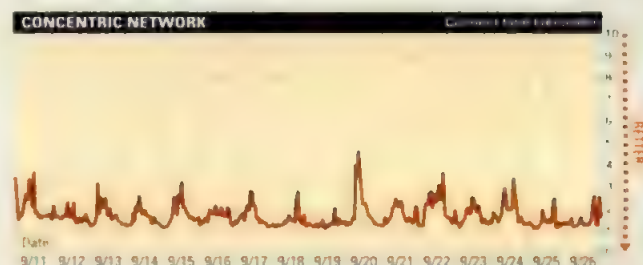
We took advantage of any online setup options unless the service required us to call. We chose the lowest level of service

Continues on page 228



▲ These graphs show the average hourly connect times for the services, measured by Service

Metrics over a two-week period. The days in the graphs start at midnight, Pacific daylight time.



Although the Web is a moving target in terms of performance measurement, we were able to

see some trends among the services. Most of them tended to peak around midday, when busi-

ness on your site by default to save you the space. Instead, you can copy any scripts you need from the Site Manager page to your CGI directory along with a functioning sample. We appreciated the simple, direct interface after dealing with more complicated alternatives from Interland, MindSpring, and Web2010.

The Site Manager has no interface for creating or deleting accounts. You send a request to email@awc.net, including the

password of each account to create. Most other services we tested have a secure Web-based interface for this function.

Advanced Web Creations has support for some simple, file-based Unix databases (B-Tree, DBM, and HASH) but not MSOL or MySQL, which Web2010 offers.

It's hard to overlook the problems we had getting started with Advanced Web Creations. We found no special advantages, so you're best off looking elsewhere.

Concentric Network

Concentric Network Corp.; 800-539-0214, 408-817-2695; www.concentric.com.

● Positioned as a full-service company, Concentric Network offers hosting services, dial-up ISP service, DSL, and value-added software packages on the server. The company does a good job assisting you with building and maintaining your site, but it lacks database support in its



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BENCHMARK TESTS

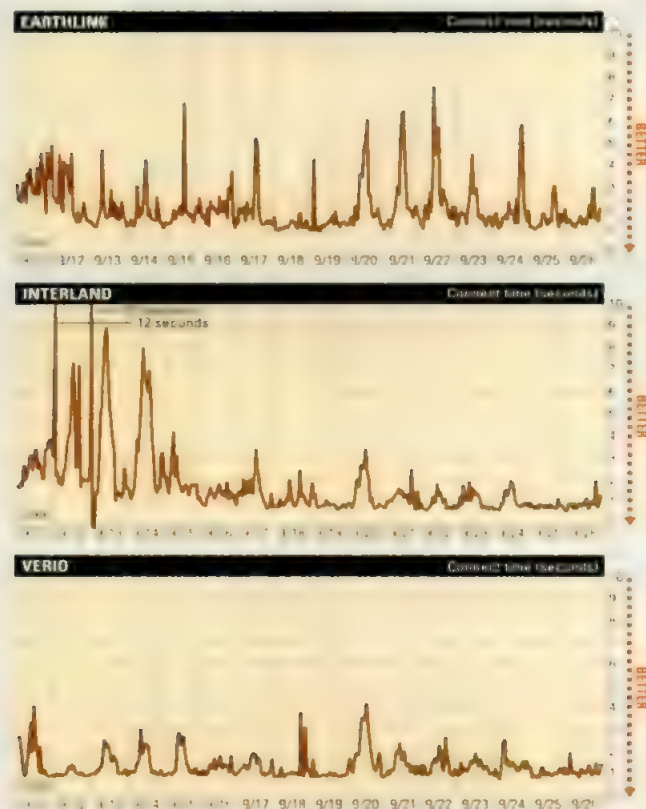
Continued from page 226

that supported a fixed IP address, and we tried to purchase accounts using just the IP address. All but Interland required us either to use a subdomain or to purchase a domain name.

Our evaluation included a thorough review of each Web host's administration interface—both for e-mail, where we set up several accounts, and for the site itself. Customer support is another central component of the Web hosting experience—and the reason we had decided to sign up and test incognito. Via e-mail and the telephone, we posed a number of questions about our options for expanding the site with the host as well as common questions that a Webmaster might have.

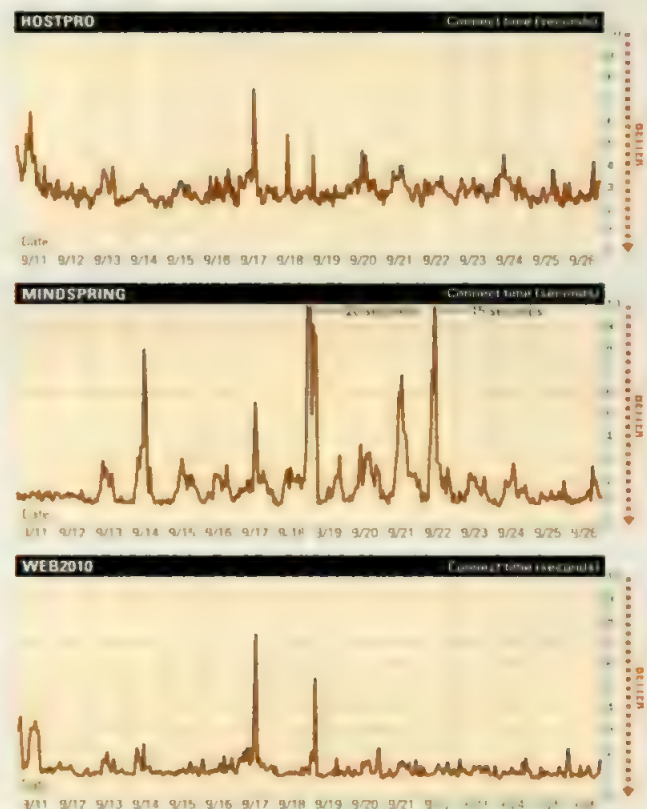
Once our test sites had been published, we worked with Ser-

vice Metrics (www.servicemetrics.com) to test the connection speed and reliability of our site on each Web host in our roundup. (Webmasters can use Service Metrics to evaluate the performance of their own sites and others on a one-time or an ongoing basis.) Service Metrics measured the access times for our test Web sites by connecting to them from 21 data collection agents located at Internet service providers around the U.S. Each agent connected three times an hour, 24 hours a day from September 11 through September 26, 1999. The agents recorded the connection time as well as the time it took to download the home page and all its elements, timing from when the first request was made to when the last page element finished downloading.—*Analysis written by Jay Munro*



nesses on both coasts are online. Overall, the services averaged an acceptable connect time of 1 to 3 seconds. Verio, Concen-

tric, and Web2010 showed exceptional tolerance to loads, while MindSpring and Advanced Web Creations had wider perfor-



mance swings than the others. EarthLink had at least one spike a day but otherwise exhibited reasonable speed. Our Interland

site had a problem early on (see the details in the text above), but once that was resolved, performance was very good.

shared Web hosting offerings.

Concentric's shared hosting plans—currently available only on Unix—are geared toward ease of setup and use, with a variety of canned scripts and components to add to your site. After signing up, we logged on to a special administrator page, where we entered a setup wizard. You can exit the wizard and reenter it later from the control panel, where you can also modify any of the settings individually.

The wizard lets you enable logging, enable the Site Builder feature, upload files, and add users and their e-mail addresses. It also offered us step-by-step help configuring several popular Windows mail clients.

The Site Builder, another wizard, lets you build a structured Web site for your organization. It offers many color and style themes, and it let us add some of Concentric's many optional features, such

as a discussion board.

The Control Panel is well organized, dividing administrative tasks into logical groupings such as "Change My Password," "Edit My Profile," and "My E-Mail Settings." Unfortunately, the page is also a bit cluttered with graphs showing your resource utilization, as well as Concentric news and advertising.

Concentric's biggest drawback is its lack of database support on the server. If



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Concentric's packaged services fit your needs, you may not need to use a database yourself, but this is a serious limitation. Concentric plans to support Microsoft Access and FoxPro on its forthcoming Windows NT shared hosting plan, however, and you can get database access on a dedicated hosting plan.

EarthLink

EarthLink Network Inc.; 800-955-0186; www.earthlink.com/business/hosting/.

● For such a large and well-known company, EarthLink's Web hosting service is spartan, and its processes are strikingly old-fashioned. An existing EarthLink customer with modest hosting needs may find placing a site on EarthLink a convenient decision, but anyone else can get a better deal elsewhere.

EarthLink is the only service we reviewed that doesn't let you sign up for a hosting plan online. We filled out a form on the company's site expressing interest in Web hosting and other EarthLink services. A week later, we were still waiting for a call back, so we took the initiative and called up on our own. (If you try this yourself, make sure to call during West Coast business hours.)

When we signed up, we got our real surprise: EarthLink sells Web hosting only to its dial-up ISP customers. Just in case there's any question in your mind, there's no good reason for this rule, other than from EarthLink's perspective.

The low-end Starter Site plan has a reasonable, mainstream price (\$19.95 per month, not counting the \$19.95 a month for the dial-up ISP account). The disk and traffic limits are well below the competition's, though—just 10MB of disk space and 500MB of traffic. The sites are Unix-only.

After these early hassles, we had no trouble creating our site. EarthLink has a site-building program called Click-n-Build and a minimal collection of CGI scripts that let you send mail based on a Web form and capture form data to a file. You do not get database support, though. Click-n-Build builds template-based sites that are attractive but no better than those that a free site such as Tripod offers. Free sites don't have CGI scripting, though, and EarthLink also lets you

restrict site access to particular users. And you can upload third-party CGI scripts.

During our testing, EarthLink and MindSpring announced a merger, to be completed in the first quarter of 2000. The combined company will use the EarthLink name, but the fate of the EarthLink services has not yet been decided.

HostPro

HostPro; 888-638-5831; www.hostpro.net.

● A full-featured hosting service, HostPro worked well for us. The pricing is reasonable, and our experience with the service was pleasant. But its rival Interland offers a more generous number of e-mail accounts, capacity for data transfer, and amount of disk space.

HostPro has a rich selection of Unix and Windows NT offerings. We selected a Windows NT account to give us greater variety in our evaluation.

Feature for feature, HostPro's low-end packages—especially on Unix—are affordable but don't stand out. They include only six POP3 e-mail accounts and six aliases. The \$29.95 NETnt plan, \$10.00 more than HostPro's lowest-cost Unix plan, includes support for a FoxPro or Microsoft Access database on the server, but database support under Unix doesn't begin until you've plunked down \$39.95 per month for the NETplus plan (which also has increased storage and traffic limits).

HostPro has an outstanding Windows NT control panel. Password-protecting a

you're likely to need accessible online.

HostPro support—including phone support—is available 24 hours, 7 days. We sent an e-mail support question as a test and received a quick (30-minute) automated response, giving us a tracking number. The actual response arrived 1 hour 10 minutes after the original question, a perfectly acceptable period. A second question was answered within an hour. But HostPro never responded to our third question. We called the toll-free number on a national holiday and resolved the issue on the phone.

We didn't notice any downtime with our HostPro account. HostPro hosts servers only at a single location, unlike MindSpring or Verio, but it has numerous redundant connections to multiple Internet backbones.

Interland

Interland Inc.; 800-214-1460, 404-586-9999; www.interland.com.



With high limits on traffic and disk space and unlimited e-mail accounts, using Interland is a good deal. It also offers 24-hour, 7-day support, decent database facilities, and numerous other options for hosting sophisticated Web sites.

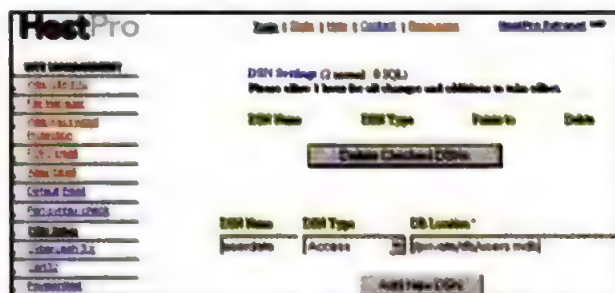
Like HostPro, Interland has a variety of affordable Windows NT and Unix plans. We chose a Windows NT plan for our tests. Some minor problems getting our site up were quickly resolved with Interland's tech

support over a holiday weekend.

With the exception of Web-2010's "unlimited" offer, Interland's traffic limits are the highest in this story. The entry-level Feature Plan includes a generous 5GB per month of data transfer. Interland also provides unlimited e-mail accounts on all of its plans. That also means unlimited forwarding accounts and auto-responders.

Interland's administration pages are powerful but somewhat awkwardly organized. Functions are divided into three main sections—Account Functions, File Functions, and Server Functions, each with subsections—but we didn't find the sections logical.

Once you locate them, the individual functions are easy to use. We had no trou-



HostPro's control panel lets users manage their databases easily.

particular file or directory is easy, and HostPro has an excellent screen for managing ODBC Data Source Names (DSNs), making it easy to access your database. Some other services, such as AWC, force you to call tech support for administrative operations like password-protecting a directory, but HostPro makes anything

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ble password-protecting directories or files or accessing the included WebTrends traffic reports. Notably, Interland and MindSpring were the only vendors to supply printed manuals, so we always had a resource to consult if we got lost.

Interland supports Microsoft Access databases on all its Windows NT plans and Microsoft SQL Server 6.5 or 7.0 on all but its least expensive plan. This aggressive service offering is not matched by its competition, and Interland also supports Oracle databases on dedicated servers.

For Windows NT sites, Interland is hard to beat. With generous limits on traffic and no limits on e-mail accounts, Interland will serve you well.

MindSpring

MindSpring Enterprises Inc.; 888-677-7464, 404-815-9845; business.mindspring.com/hosting/index.html.

● Like Concentric, MindSpring is trying to build a full-service company for Internet services. In addition to hosting, MindSpring offers DSL connectivity, application services, and a large nationwide network of dial-up POPs. We found our MindSpring Web site easy to manage but pricey when compared with its competition and, like Concentric, limited by a lack of database support.

MindSpring's low-end IntroWeb hosting account gives you 30MB of disk space

simpler statistics pages in the standard price, and you can always download raw log files.

MindSpring service includes a reasonable selection of canned scripts, including a search engine, message board, guest book, page counter, and mail form, plus support for PHP3, an ASP-like scripting system. Although MindSpring is very liberal about letting you run CGI scripts and executables, it doesn't have any server-side database access.

MindSpring does offer excellent customer support. It and Interland were the only vendors to supply printed manuals, alleviating the need for many customer-support queries. It also has 24-hour, 7-day telephone support as well as online support options. We sent two questions to the e-mail support address; MindSpring responded to one question in just under 24 hours. After 48 hours, we called support about the other issue, which it resolved promptly.

The administrative options are very well done: MindSpring has the richest control panel we reviewed. We had to hunt around to find some functions, but you can get to anything you need from one page.

During our testing, EarthLink and MindSpring announced a merger, to be completed in the first quarter of 2000. The combined company will use the EarthLink name. MindSpring has some strong features, but smaller companies like Interland and Web2010 are more attractive. Perhaps the postmerger EarthLink will be more competitive.

Verio

Verio Inc.; 888-438-8374; home.verio.com.

● Built through the rapid acquisition of smaller hosting services over the last couple of years, Verio is a large, full-service Web host. Our testing suggests that it still has some consolidation work to do and that its attention and services are focused on higher-end customers.

Administrative controls are a strength; the control-panel's e-mail management screens are straightforward, as are the password screens. Verio also includes the WWWBoard discussion software and Excite search engine for your site, even in its least expensive plans.

The low-end plan we bought is not



The Verio control panel offers simple access to administration and scripts.

notable for high limits or interesting features, but Verio does have a plan with practically anything you might need. It just costs more. For example, more expensive plans can use a mail server that provides Web-based clients, which is good if you're building an extranet or you want your workforce to have access to e-mail from anywhere. Interland is the only host we reviewed that includes this in the plan we tested.

Verio offers MS SQL and MySQL for those using Unix hosting, but you don't get any database support on the least expensive plan. All Windows NT plans can use Microsoft Access databases, and users of the Hosting NT Plan 2 (\$99.95 a month) get Microsoft SQL Server.

Verio's growth through acquisition became an issue when we needed customer support. We sent a question to the e-mail address given us in correspondence with Verio (support@verio.net). We received a response 5 hours later telling us that our site was actually hosted by Hiway, not Verio. True, the e-mail stated, Verio owns Hiway, but Verio would have to forward our query to support@hway.net. Hiway never got back to us. We had to dial a toll number in Boca Raton, Florida, to complain; Verio offers toll-free support only to customers on more expensive plans.

Companies that need large, dedicated hosting plans have a lot to look at in Verio. The little guys are better off dealing with other services, those more interested in catering to them.

Web2010

Shaver Communications Inc.; 888-932-2010; www.web2010.com.

● The offbeat Web host in our roundup, Web2010, doesn't have the same sheen of



The MindSpring File Manager lets you manage files via a Web page.

and 2GB of data transfer, which is in line with the other hosting services, but the \$50 setup fee and \$29.95 per month run to the high end of the spectrum. Value-added services, such as commerce software and WebTrends site statistics, also come with high price tags. MindSpring does include

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SUMMARY OF FEATURES

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Web Hosting Services



■ YES □ NO	Advanced Web Creations	Concentric Network	EarthLink	HostPro	Interland	MindSpring	Verio	Web2010
Unix Basic monthly fee/Setup fee	\$24.95 / \$30.00	\$24.95 / \$50.00	\$19.95 / \$25.00	\$19.95 / \$50.00	\$19.95 / \$40.00	\$29.95 / \$50.00	\$24.95 / \$50.00	\$19.95 / \$39.00
Unix Disk space/bandwidth included	100MB / 2GB	40MB / 3GB	10MB / 500MB	60MB / 2GB	100MB / 5GB	30MB / 2GB	40MB / 3GB	30MB / Unlimited
Windows NT Basic monthly fee/Setup fee	N/A	N/A	N/A	\$29.95 / \$50.00	\$19.95 / \$40.00	N/A	\$49.95 / \$50.00	\$39.95 / \$39.00
Windows NT Disk space/bandwidth included	N/A	N/A	N/A	60MB / 2GB	100MB / 5GB	N/A	40MB / 3GB	50MB / 10GB
Commitment required	1 month	1 month	1 month	3 months	3 months	1 month	3 months	3 months
Money-back guarantee/Setup fee refundable	☒ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
Charge to transfer domain from another host	\$30	Free	Free	Free	Free	Free	Free	Free
Version of Unix/Windows NT 4 Service Pack required for shared hosting	BSD 2.26 / N/A	BSDI 3.1 / N/A	Solaris 2.6 / N/A	IRIX 6.5 / N/A	Red Hat Linux 5.2 / SP 5	DEC Unix 4.0F / N/A	BSDI 3.1 Free BSD 3.2 IRIX 6.5 / SP 3	BSDI 4.01 / SP 5
Web host provides reliability records	☐	☐	☐	☐	☐	☐	☐	☐
SCRIPTS PROVIDED								
Page counters/Guest book	☒ ☒	☒ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☐ Optional
FormMail/Search	☒ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☐ Optional
DEVELOPER SUPPORT								
Unrestricted custom CGI scripts allowed	☐	☒	☐	☒	☒	☒	☒	☒
ASP/Perl/PHP	☒ ☐ ☐	☐ ☒ ☒	☐ ☐ ☐	☐ ☐ ☒	☒ ☒ ☐	☐ ☐ ☐	☐ ☐ ☐	☒ ☒ ☒
FrontPage 2000 support for Unix/Windows NT	☒ N/A	☒ N/A	☒ N/A	☒ ☒	☒ ☒	☒ N/A	☒ ☒	☒ ☒
Database support on basic service offering	☐	☒	☒	☒	☒	☒	☒	☒
E-MAIL								
POP3/forwarding accounts included	5 / 3	10 / 10	1 / No limit	6 / 5	No limit / No limit	10 / No limit	11 / 999	20 / No limit
Web-based client interface	☐	☐	☐	☐	☒	☒	☐	☐
SMTP/Sendmail	☒ ☒	☐ ☒	☒ ☒	☒ ☒	☒ ☒	☐ ☐	☒ ☒	☒ ☐
SITE ADMINISTRATION								
Web-based e-mail/administration	☒ ☒	☒ ☐	☐ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒
Create custom error messages	☒	☐	☒	☒	☒	☒	☒	☒
Access FTP logs directly/via reports	☐ ☐	☒	☒	☐ ☐	☒	☒	☒	☐ ☐
FTP ACCESS								
Administrator can control FTP access	☒	☒	☒	☐	☒	☒	☒	☒
Anonymous FTP/drop boxes allowed	☐ ☐	☐ ☐	☒ ☐	☐ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒
ADDITIONAL SERVICES								
Macromedia Flash/Shockwave support	☒ ☒	☐ ☐	☒ ☒	☒ ☒	☐ ☐	☒ ☒	☒ ☒	☒ ☒
Microsoft WMT/Real Media support	☐ ☒	☒ ☒	☐ ☒	☒ ☒	☒ ☒	☐ ☐	☒ ☒	☐ ☒
Thawte/Verisign certificate authority	☒ ☒	☒ ☐	☐ ☐	☒ ☒	☒ ☒	☒ ☒	☒ ☒	☒ ☒
SQL database support on shared hosting	☐	☐	☐	☒	☒	☐	☒	☒
TECHNICAL SUPPORT								
Telephone number for free technical support	800-248-0151	800-424-0532	800-890-5128	888-638-5831	800-589-5060	800-719-4660	800-905-7675	407-445-3033
Hours (eastern time)	9:00a-10:00p M-F, 10:00-5:00 Sat	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	9:00-9:00 M-F noon-6:00 Sat Sun
Web-based support/E-mail support	☐ ☐	☐ ☐	☒ ☒	☒ ☒	☐ ☐	☒ ☒	☒ ☒	☒ ☒

N/A—Not applicable. Windows NT hosting is not available from this provider

professionalism that its competitors offer. For example, it's the only Web host with an e-mail address specially set up for receiving abuse (abuse@web2010.com). But don't let the quirkiness frighten you: Web2010 has many compelling features. Just be ready to do things the hard way.

Web2010 specializes in low-cost shared hosting accounts. The Basic plan costs only \$19.95 per month. Both it and the \$24.95-per-month Premier plan have no limit on data transfer, and Premier comes with unlimited POP e-mail accounts. Only Interland comes close to being as generous. Value-added features, like Real Media Server at \$10 per month,

are also very inexpensive. Web2010 offers only Unix hosting.

But "unlimited" may not mean what it says. According to the Terms and Conditions agreement, "Sustained average bandwidth usage...over the course of any 7 days shall not exceed 64 kilobits per second." Sounds like a limit to us, albeit a very high one, since it works out to about 5GB for the week.

Web2010 eschews a fancy control panel like Interland's or MindSpring's; you administer your site using FTP, telnet, and request forms to tech support. Everyday Unix users will feel right at home. For example, you have two ways to create and

manage e-mail accounts: You can fill out an online request form and send it to tech support, or you can download and edit the .domains file in your root directory.

On the other hand, Web2010 includes or recommends far more scripts for chat rooms, shopping carts, discussion boards, and other elements to add to your site than its competitors. You can also use either MSOL or the MySQL database for an extra \$5 per month.

Web2010 is clearly not for everybody. User-friendliness is not its strong suit. But if you're confident in your own abilities, and maybe if you like its attitude, you could be happy doing business here. **PC**

An abstract graphic featuring a dark, textured shape resembling a hand or a network component, outlined with glowing white lines that form a complex, interconnected pattern. The background is a solid light blue.

Here's
something
interesting.
Something
that may

throw a
c u r v e

into your
network
plans. The
10/100/Gigabit
switches with
the highest value
and lowest
price per port
aren't from
3Com, Bay
or Cisco.

A woman with short dark hair, wearing a black dress with white geometric patterns, is shown from the waist up. She is looking slightly to the right with a subtle smile. Her right arm is extended upwards and to the right, holding a small object. The background is a solid, vibrant blue.

They're from
Hewlett-Packard.

HP ProCurve

L2 and L3
10/100/Gigabit
switches give you more
for your money.
All ports are switched.
All ports autosensing.
All industry standard.
All at a price per port up
to 50% less than other
major network companies.

HP made 10/100
switching very affordable.
Now we're doing the
same with Gigabit. To ready
your network for
bandwidth hungry applications
like e-mail, internet access,
voice over IP (VoIP) and video.

And HP introduces
**Gigabit Ethernet
over copper,**
beginning to ship
October 1, 1999. At an
estimated street price of
just \$299 per module.

To upgrade your network.
Over category 5 copper cabling.
For less than half the cost of
fiber optic connections.

HP ProCurve are the
fastest growing
10/100/Gigabit

switches in the world.
Network Magazine,
Network Computing,
VAR Business and others
have awarded them their
highest marks.

And they all come with
HP quality and reliability
plus **free** lifetime
warranties, software
upgrades, next business day
advance replacement,
and HP Customer Care By Phone.



Switch 4000M
10/100/Gigabit

HP ProCurve 4000M \$89 per port
3Com SuperStack II 3300 \$156 per port
Bay Networks 450T \$173 per port
Cisco 3524XL \$156 per port
72-port configuration list prices



Switch 2424M
10/100/Gigabit

Still skeptical?

That's natural.

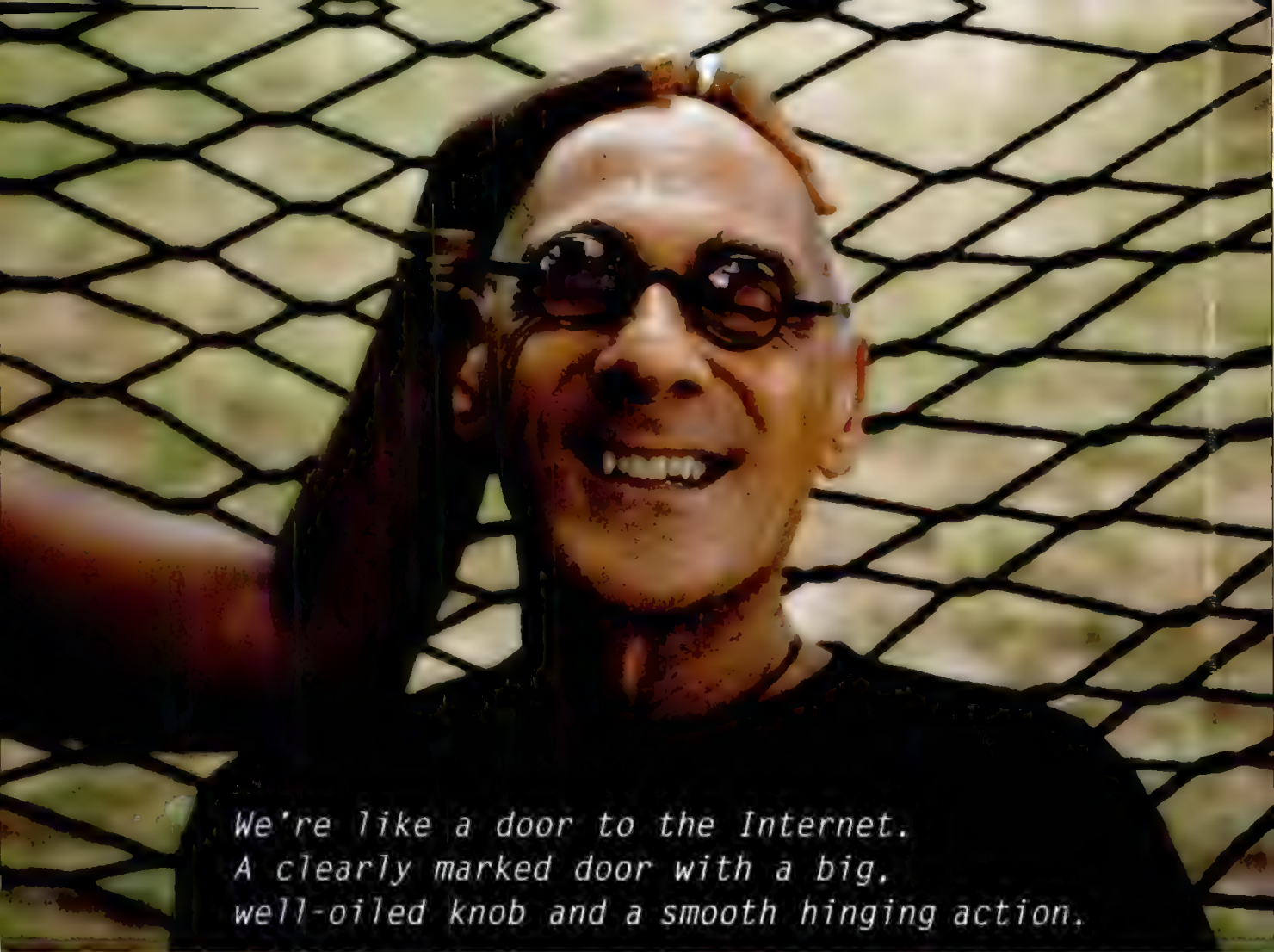
Which is why you
should go to our
website and ask
for a Customer
Representative to
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your system with the latest benchmark programs from ZD Labs: Content Creation Winstone, I-Bench, and 3D WinBench 2000. **Page 240**



Pursue

hackers by using BlackICE Defender to detect Internet intruders. **Page 247**

HARDWARE 240

Our benchmark tests now reflect the demands of the Internet.

INTERNET 247

Find out whether your system is vulnerable to Internet attacks.

OFFICE 257

Office 2000 offers new, advanced features for collaboration among networked users.

DESKTOP 261

Once upon a time, partitioning your disk was a good idea. Now, we show you how to unpartition it.

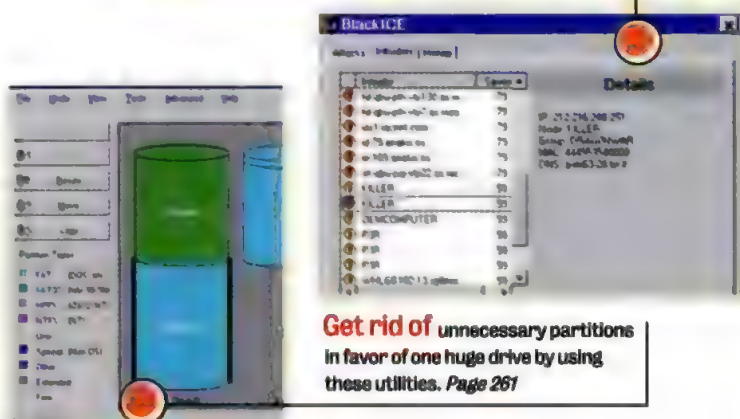
PC TECH 265

Active Directory Service Interfaces give applications access to several directory services.

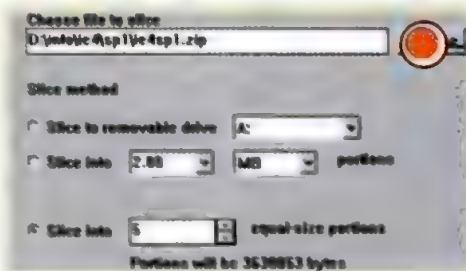
UTILITIES 270

Slice32 divides large files into smaller sections for data transfers between PCs.

You'll find all of the articles, examples, and code files in this section at Solutions online. www.pcmag.com



Get rid of unnecessary partitions in favor of one huge drive by using these utilities. **Page 261**



Slice

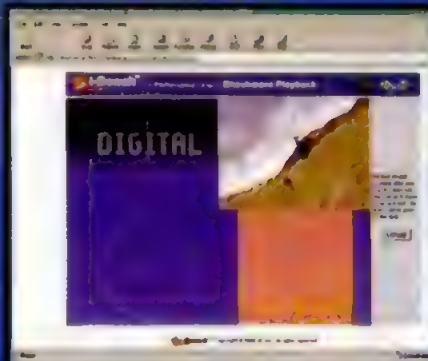
files into equal-size or media-optimized portions with this issue's utility. **Page 270**

CONTENT CREATION WINSTONE

2000 lets you test PC performance while creating Internet content.

I-BENCH 1.0 brings together tests for all the key Internet technologies.

A HIGHLIGHT OF 3D WINBENCH 2000 is its use of cooler, more gamelike scenes, such as the one above.



New Directions in Testing Technology

Our new benchmark tests reflect the ever-increasing prominence of the Internet.—By Mark L. Van Name and Eric Hale

In this issue each year, PC Magazine Labs introduces the newest versions of Ziff-Davis's industry-standard PC benchmark tests. This year, we're excited to be releasing a new member of the Winstone family, Content Creation Winstone; an entirely new benchmark test, i-Bench 1.0; and the latest version of an industry staple, 3D WinBench 2000. These tests are an integral part of our review processes, as you'll see in "Fast PCs" in this issue. This year's benchmark tests are the results of many person-years of development effort by ZD Labs.

Content Creation Winstone 2000 uses scripts that exercise real applications to produce an overall measure of a PC's performance while creating Internet and other types

of content under Microsoft Windows.

Our new benchmark test, i-Bench 1.0, lets you examine the performance and capabilities of a variety of Internet client types. With i-Bench 1.0, you can compare the Internet client performances and capabilities of everything from a Windows-based PC to a Mac to a non-x86-based thin client.

3D WinBench 2000 lets you address the performance and rendering quality issues that the latest set of 3-D graphics accelerators and systems raise. It measures 3-D graphics performance by using the Windows DirectX 7 API to render 3-D scenes similar to those in games.

At this time, we are not releasing updates of the existing Winstone 99 and WinBench 99 benchmark tests. We will make those updates available in 2000.

Unlike most software products, these benchmark tests are available for only a small shipping and handling charge (or free, for the downloadable parts): You can find an order form at www.zdbop.com.

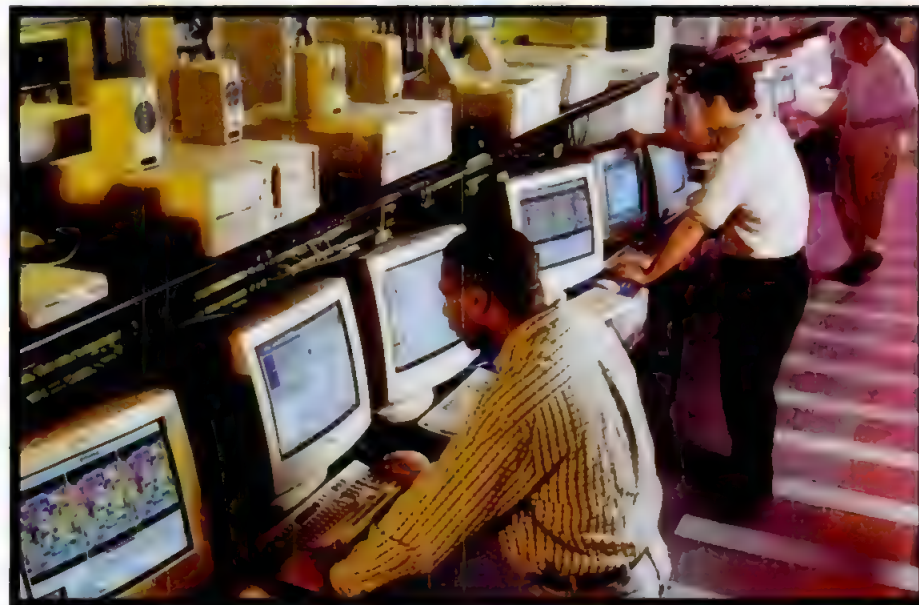
One unavoidable consequence of new benchmark test releases is that the results our tests produce also change. Thus, 3D WinBench 2000 results are not comparable to those of 3D WinBench 99.

CONTENT CREATION WINSTONE 2000

What we hear from users is that modern PCs are fast enough for many operations but that everyone ends up waiting on certain ones. These operations, which we call *hot-*

PC MAGAZINE LABS:

Analysts running the new benchmark tests.





spots, are the focus of the tests in Content Creation Winstone. Last winter, we conducted an extensive online survey to determine which computing tasks kept people waiting, and we applied that knowledge as we built Content Creation Winstone. Users also tend to have multiple applications active at once, so Content Creation Winstone keeps multiple applications open simultaneously and switches between them. It will run on Windows 98, Windows NT, and Windows 2000.

We chose the following applications for Content Creation Winstone, based on a combination of market data and feedback from editors at *PC Magazine* and other ZD publications:

- Adobe Photoshop 5.0.
- Adobe Premiere 5.1.
- Macromedia Director 7.0.
- Macromedia DreamWeaver 2.0.
- Netscape Navigator 4.6.
- Sonic Foundry Sound Forge 4.5.

The benchmark program runs a test script that involves all these applications and times how long a PC takes to complete the script. It then converts each timing to a score relative to the time a base machine took to complete the same script. In this case, each overall score is relative to the base machine's score, which we defined as 10.0. The base machine is a Dell Dimension PC running Windows NT 4.0. It has a 233-MHz Pentium processor with MMX, 64MB of SDRAM, and a graphics resolution of 1,024-by-768 using 24-bit color.

As you might expect of a benchmark program that involves so many applications, Content Creation Winstone is big—over 80MB—so it is available only on CD-ROM.

I-BENCH 1.0

i-Bench 1.0 sets a new standard for testing the performance, capabilities, and standards compliance of a wide range of Internet client types. With it, you can test how well a client supports such technologies as HTML 4, Java, MP3, QuickTime, VRML, Windows Media Technology, XML, and many more.

We've tested i-Bench on many client types, including Windows PCs running Microsoft Inter-

net Explorer and Netscape Navigator, Macs running IE and Navigator, Linux PCs running Navigator, Windows CE devices, and (for a limited set of tests) Web TV and Palm OS systems. As this list implies, i-Bench will run on any device with a browser capable of displaying standard HTML. Not all tests, however, will run on all devices, nor will all of the benchmark program's automation features work on less capable devices.

Some tests in i-Bench, such as those for Java performance, are not sensitive to bandwidth; others are. Because bandwidth is one of the most important factors in the way people experience the Web, we've compressed much of the content in i-Bench at a variety of different rates. At the low end, the data rates are suitable for use with a 28.8-Kbps modem. At the high end, the data rates are more appropriate for intranet clients running on LANs.

We're making i-Bench available via ZDNet at www.i-bench.com, so you can run it directly from any Web client. We've built in support for a server-side database, so you can save your results and compare them with the results of other users around the world. If you want to test on your own setup, you can order a CD with the full server-side setup information. (You will need to supply your own database server.)

We plan to expand and improve the tests in i-Bench frequently, and we'll continue to add support for more client types. This is one benchmark program whose home page you'll want to check frequently.

3D WINBENCH 2000

To gauge a 3-D accelerator's performance, you have to consider its speed, which 3-D rendering features it supports, and how well it implements those features. 3D WinBench 2000 lets you assess all of these aspects of 3-D performance and quality.

To help you verify that an accelerator correctly implements the rendering options it claims, 3D WinBench 2000 includes a suite of approximately 70 quality verification tests. Each of these tests contains an image of how a scene should appear, and you can compare that image against the one the accelerator produces. The benchmark program also provides an automation facility that can, at your option, automatically determine whether the implementation is acceptable.

The main indicator of rendering performance is the 3D WinMark 2000 score. The 3D WinMark test suite, which produces that score, reflects both an adapter's fill rate and its triangle rate. Before you can execute that suite, you must run the corresponding quality tests, so the benchmark program can know which features you believe the accelerator correctly implements.

Though 3D WinBench 2000 offers many of

Faster Digital Camera Transfers

Digital cameras typically come with serial cables and software to transfer images to your PC for editing, storing, e-mailing, Web uploading, presenting, and printing. The downsides of serial cable connections are slow transfer rates and significant battery power consumption for the cameras.

Sony Mavica cameras store images on floppy disks, which are limited in storage space but very convenient for transferring images to PCs. Other digital cameras store images on removable media, usually CompactFlash or SmartMedia cards, and occasionally on PC Card memory. External memory card reader/writers, which typically connect via parallel or USB ports, are available from several vendors and are a great idea if you capture (and transfer) a lot of digital camera images. The Antec PhotoChute3 USB (\$99 direct, www.ante-inc.com) is an especially versatile reader/writer, with separate slots for SmartMedia, CompactFlash, and PC Card memory media.—Bruce Brown

Wired Right?

I just moved to an older home, and I want to make sure that the electrical outlets are safe for my computer equipment. What should I check, and how?

Karen Abbott
via the Internet

The most important thing is to check whether your outlets are wired correctly. The presence of a three-prong outlet is no guarantee that it is grounded, even in newly constructed homes. An outlet that is wired incorrectly or not grounded can damage your equipment or put you at risk for a dangerous shock.

Fortunately, testing your outlets is easy. Buy an outlet tester—\$5 to \$10 at electronics and hardware stores—and plug it in the socket. Indicator lights will show whether the wiring is correct or not. If there is a problem, get it fixed by a professional electrician. Such problems may also indicate other trouble spots in the house's wiring that need attention.—Alfred Poor

www.adobe.com/creative
The creative source

Keeping Your Cool

My Pentium computer system has no cooling fan. Do I need to install one?

Graham Loff
via the Internet

If your system is not experiencing intermittent and unexplained crashes—especially after running for a period of time—then you may not have a heat problem. Chances are that your system has a fan as part of the power supply, and in most cases, that is sufficient.

If you want to add more cooling to your system, one of the first steps to consider is a fan for your CPU, as that is the component most susceptible to heat problems. You can find a CPU fan for \$10 or less.

You can also add a fan to an empty disk drive bay—provided that it has an opening in the case. These fans cost from \$10 to \$30, depending on features, and can be especially helpful in cooling high-performance hard disks or CD-R drives.—AP

the same basic capabilities as its predecessor, 3D WinBench 99, it differs from the earlier program in many ways. For instance:

- The 3D WinMark 2000 suite includes new scenes that are more gamelike in appearance and function.
- 3D WinBench 2000 uses Microsoft's new DirectX 7 interfaces. DirectX 7 must be present on the PC, though the benchmark program will work with DirectX 6 device drivers. (Some new DirectX 7 features, such as support for hardware transformation and lighting, will not be available with DirectX 6 drivers.)
- 3D WinBench 2000 uses double-buffered rendering with vsync off, instead of the triple-buffered, vsync-on rendering 3D WinBench 99 employed.
- The 3D WinBench 2000 3D Processor Test uses the Null device, as did the one in 3D WinBench 99. Unlike the previous version, however, this new 3D Processor Test computes its score by running the processing (but not the drawing) portion of the entire 3D WinMark test suite.
- Some tests in the 3D WinMark 2000 test suite require trilinear filtering and at least two texture stages.
- 3D WinBench 2000 will run on Windows 98,

Windows 98 SE, and Windows 2000 Beta (at least as of RC 2).

- The default in 3D WinBench 2000 is to use hardware transform and lighting if the accelerator offers that ability.

As in past years, we recommend some standard settings for 3D WinBench testing. This year, those standard settings include

- double buffering,
- vsync off,
- 32 bits of color per pixel,
- 32 bits of Z per pixel,
- 75-Hz refresh rate.

To complete the tests with these settings, an accelerator with a traditional architecture needs at least 16MB of frame-buffer RAM.

THE FUTURE

ZD Labs is already developing the updates to Winstone 99 and WinBench 99, as well as other new benchmark test programs. When those products are ready, we'll announce them in these pages. **PC**

Mark L. Van Name is vice president and general manager of ZD Labs. Eric Hale is director of ZD Benchmark Operation.

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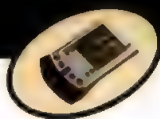
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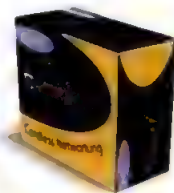
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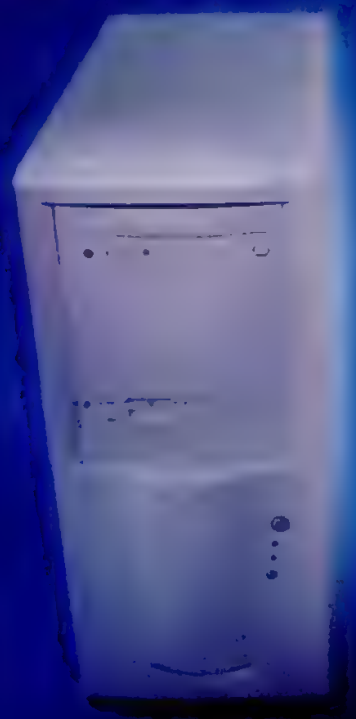


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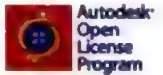
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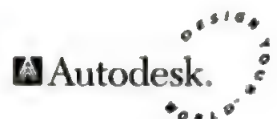


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In Pursuit of Internet Intruders

Is your system secure while you're connected to the Internet?—By Sal Ricciardi

Readers often ask whether the data on their PCs is safe while they're surfing the Internet. I wish I could say that in most cases it is and that there's no need to worry, but I can't. The truth is, when you connect to the Net, you're plugging into the largest two-way network in the world. If you're not diligent about protecting yourself, your system may well be vulnerable. It may already have been compromised, and it's probably being probed for signs of weakness even as you read this.

There are a number of ways a malevolent someone or something can find his, her, or its way into your system. For instance, it's well known that executable code downloaded to your computer during an Internet browsing session can wreak havoc if you run it. The onus is on you to decide whether to trust such a download. The latest browsers provide mechanisms that let you decide whether to accept or reject certain types of downloadable executable code, either always or on a case-by-case basis. Because these downloadable code objects improve and often even define your online experience, choosing the most restrictive option is not ideal. Digital certificate authorities can help you decide whom to trust, but there's still some risk involved.

Even more insidious are stealth-mode tactics, the tools of today's connected criminals. In this case, the attempt to subvert your system comes

in one of two forms. First, the perpetrator can take advantage of your leaving File and Print Sharing turned on in the Network section of Control Panel for your Internet connection, which is rather like leaving your door open and placing your wealth in full view a few feet inside the door. Sure, you can leave File and Print Sharing turned on and password-protect your shares if you really want to, but this is like placing a speed bump on the autobahn. It'll slow the criminals down, but it's just a matter of time before they get you.

The second way your security can be compromised is through a back-door program, such as Back Orifice or Netbus, which installs itself in Trojan horse fashion by arriving as an e-mail attachment or by posing as some useful executable program. Once run, these programs slither into place on your system and wait. When the intruder connects from his or her distant lair to the back door, he or she often has full access to your system.

These intrusions often happen innocently enough, at least from the victim's perspective. After all, turning off File and Print Sharing on your Internet connection is a fairly nerdy sort of thing to do. Recent versions of Microsoft's operating systems automatically detect this vulnerability and ask you politely if you want to turn File and Print Sharing off. This is a good thing, but I can still imagine a computer novice saying, "File and Print what?" It's a toss-up whether he'd choose yes or no.

The back-door programs prey on those of us who think an e-mail attachment named Runme.exe is innocent-looking enough. After all, it was received from Aunt Mary attached to an e-mail whose subject says "Check This Out." Later, it's discovered that the body of the message reads "...and tell me what this is." Even an attachment from Aunt Mary could have been forwarded from some who-knows-who from who-knows-where. On the Internet, everything is suspect.

So how do you protect your system? You start by turning File and Print Sharing off (see Figure 1). You frequently run your favorite vendor's most recently updated antivirus software. You tell your browser to accept only signed downloads, and you examine the digital certificates of each and every one. You never run an e-mail attachment without letting your antivirus

Cookie Control in IE5

I just downloaded Microsoft Internet Explorer 5—over 3 hours of download! At first glance, it seems to be noticeably faster. Now, however, I have no control over cookies! I guess I'm just old-fashioned, but I like having the choice of whether to accept or deny cookies. What can I do?

Jim McGill
via the Internet

The cookie settings you knew in earlier versions of Internet Explorer have moved and left no forwarding address. To tweak cookie settings in IE5, you must create a custom security level for the Internet security zone. Select *Internet Options* from the *Tools* menu, click on the *Security* tab, choose the *Internet* security zone from the list, and click on the *Custom Level* button.

In the dialog that appears, you can enable or disable cookies globally or have IE5 prompt you to accept or reject each cookie. Session cookies (deleted at the end of each online session) are controlled separately from the persistent cookies that reside on your hard disk. The Microsoft Knowledge Base article Q196955 goes into detail on this subject; you can find it at <http://support.microsoft.com/support/kb/articles/Q196/9/55.asp>.—Neil J. Rubenking

Listing Links

In Internet Explorer, is there a way to get a list of all the links on a Web page rather than having to scroll all the way down the page and look around?

H. Anders
via the Internet

Microsoft offers a free download for Internet Explorer 5 called *Web Accessories*, available at www.microsoft.com/Windows/IE/WebAccess/ie5tools.asp. This collection of eight utilities is practically indispensable. Right-click on any Web page, and you can get a list of links on that page, or you can get a list of images with associated links. You can also open the contents of a frame in a new window, and zoom in or out of any image on the page. If you don't want to load images, you have a new *Links* button to toggle them on or off, and you have two new ways of searching. This collection is well worth the download.—Neil Randall

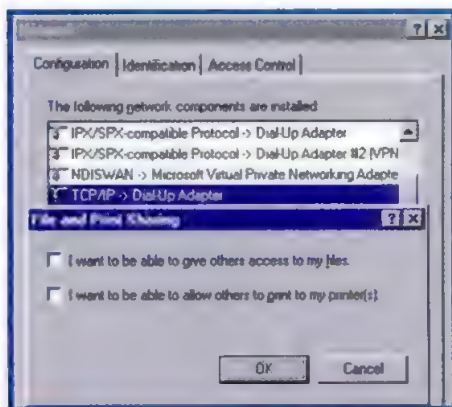


FIGURE 1: To protect your files from access over the Internet, turn off File and Print Sharing on your Internet protocol stack. First, run the Networks applet in Control Panel. Then, select the TCP/IP network component, choose File and Print Sharing, and uncheck both check boxes.

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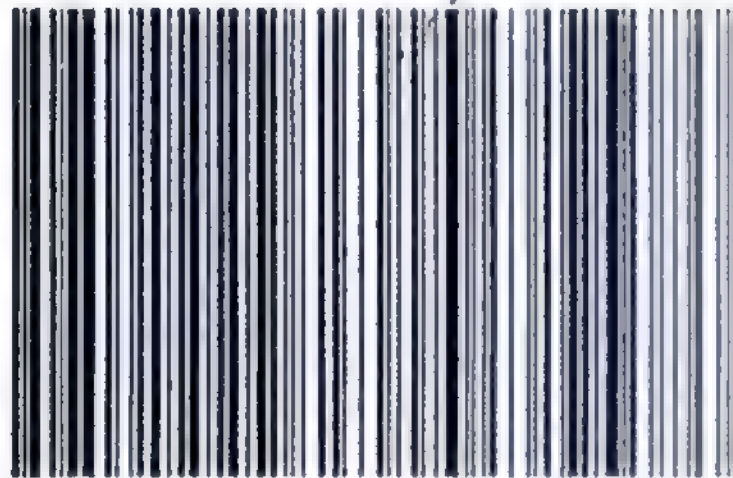
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1. Follow instructions on the other side

Back

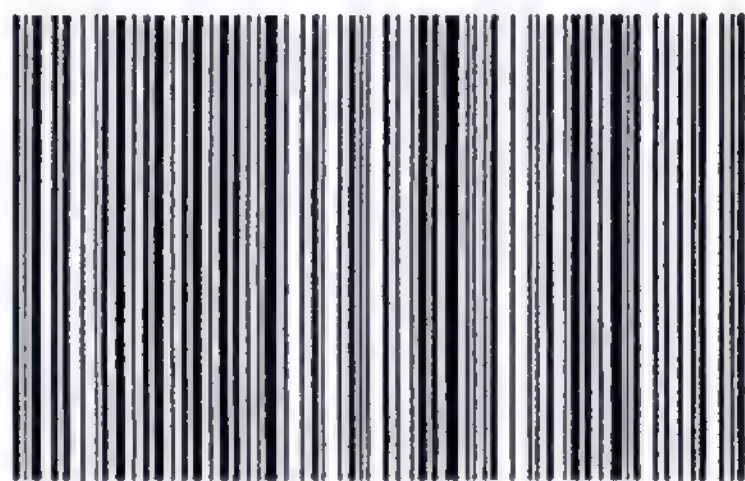
GB5511PBack-0018



Inverted Back

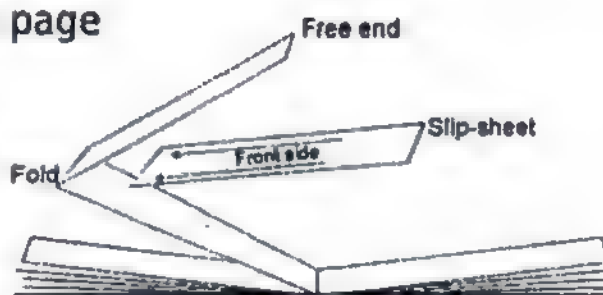
1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Open the foldout page

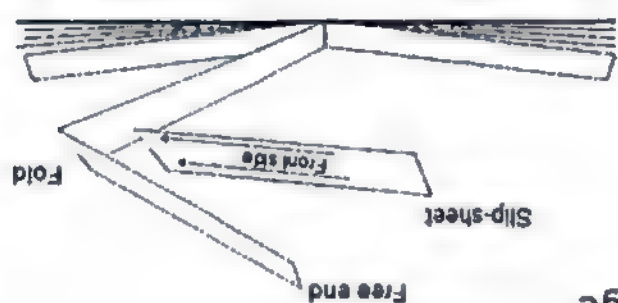
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



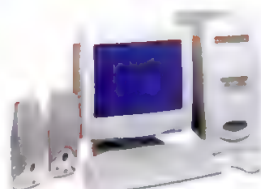
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Changing Dial-Up Properties

On a recent trip, I noticed that some areas of the country require you to dial an area code for local numbers, but without the 1 at the start. The Windows 95 dial-up connection dialog box seems to allow using the area code only if you are not in the area; then it adds the unneeded 1. From my hotel, for example, I needed to dial 9, then the area code and phone number. Is there any way to fix this?

John Cooper
via the Internet

You can solve this problem by changing your dial-up connection's properties as follows:

- Right-click **My Computer** and choose **Explore**.
- Double-click **Dial-Up Networking**.
- Right-click your connection and choose **Properties**.
- On the **General** tab, uncheck the box that mentions "use area code" (it may say *Use country code and area code or Use area code and dialing properties*).

Now Windows will dial precisely the number you enter in the **Telephone number** field.—Neil J. Rubenking

Limits of "Browse in Separate Process"

I set Internet Explorer to use the "Launch browser windows in a separate process" setting. But I learned that when you right-click on a link and select **Open in New Window**, the new window runs in the same process as the original. If the original window crashes, the new window crashes, too.

When I want to open a link in a new window, I launch the IE icon on the desktop and drag the link to the new window, which is running in a separate process. Now, if the original window crashes, the new window is unaffected.

H. E. Cane
via the Internet

In IE5, the setting in question is found on the **Advanced** page of the **Internet Options** dialog. Without this setting, every browser window is owned by the same process, and a problem in one can crash them all. As noted here, a window launched via **Open in a new window** belongs to the same process as the original. If you experience frequent crashes in IE, use this tip to contain the crash in a single browser window.—NJR

software check it first, and then only if you know the sender and were expecting the attachment. You basically erect a wall of distrust against all incoming executable software, whether attachments or downloads. You become very, very wary.

Turning off File and Print Sharing while you're on the Internet is particularly important. If you're using a cable modem, leaving this setting turned on could cause your computer to pop up as available when someone else on your network segment opens his or her Network Neighborhood icon. Even your most benevolent neighbor is bound to find that tempting.

But still, having an open porthole from your system into the vast unmanaged frontiers of the Internet makes you want to monitor every bit that traverses that opening. After all, if an interloper makes a subversion attempt, how else can you be sure to detect it? That's where intrusion detection, identification, and protection software comes in very handy. And that's why I started using a remarkable new product called BlackICE Defender (\$39.95 direct, www.networkice.com). The product detects and informs you of attempts to hack your system. It's brought a lot of visibility to what could happen on your Internet connection, and has introduced me, albeit at a great distance, to a hacker known as Killer.

BlackICE can be thought of as a personal intrusion-detection, identification, and countermeasure system. It watches all Internet protocol transmissions to and from your PC and can block malicious intrusions. The program also collects information on these attempts, some of which are shown in Figure 2. Unlike other packages of this sort, BlackICE does not require you to program sophisticated rules to tell it what to do, and you don't need any knowledge of TCP/IP ports or packet types to put it to work. The experts at Network ICE have built knowledge of over 200 intrusion techniques into the software, including all the most common ones, so that you only have to choose a level of security protection (see Figure 3) and let the program do the rest.

I put BlackICE to work for several weeks on a system using an ordinary, dial-up V.90 modem connection. During that time, BlackICE detected numerous attempts to break into the com-

puter. Almost all of these intrusions were pings and probes sent to see whether the system had one of the required back-door programs in-

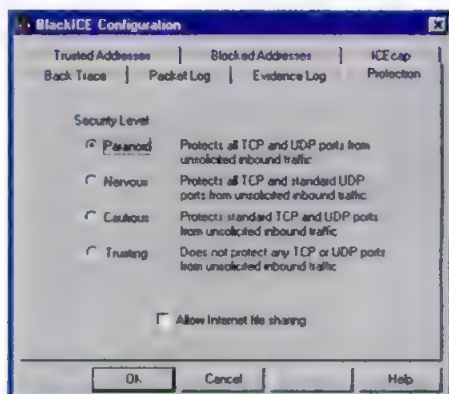


FIGURE 3: To determine your level of protection, you select one of four security levels.

stalled (it didn't). But because BlackICE has an identification component that does backtracing on suspected intruders, a rather interesting collection of data was assembled, which I was then able to use to do some sleuthing of my own.

As you can see from Figure 2, BlackICE collects the intruder's IP address and DNS name and identifies the attempt as a specific intrusion type. When possible, the software also tracks down the intruder's *node name* (machine name, Killer in this case), *group name*, and NetBIOS name, as shown in Figure 4. This information is of value to security experts in helping to identify intruders.

I started by attempting to identify Killer's ISP. First, I noted the domain name *as.wcom.net*, from the *lon-c45-017-vty41.as.wcom.net* DNS name identified by BlackICE. It was obvious to me that this was an MCI WorldCom domain, because I'm already familiar with the *wcom.net* suffix. When you're not sure, you can navigate online to www.networksolutions.com and do a *whois* search on the IP address identified by BlackICE. To search for a domain name such as *as.wcom.net* instead of an IP address, you enter *domain as.wcom.net*. When I did this, I was able to find *wcom.net* but not *as.wcom.net*, so I searched for the IP address instead.

There are a number of *whois* server databases containing information for the U.S., Europe, the military, and so on, so you might have to do several searches. I confirmed Killer as having come through MCI WorldCom by finding the 195.232.10.42 IP address in the European IP address allocations database. The information returned by *whois* identified MCI World-

Date/Time	Intrusion	IP Address	Node	Group	NetBIOS	IPIC
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42
1/19/99 12:00:00	BlackICE Defender detected an intrusion attempt from 195.232.10.42 to 192.168.1.100	195.232.10.42	lon-c45-017-vty41	as.wcom.net	as.wcom.net	195.232.10.42

FIGURE 2: Selected data collected by BlackICE Defender about attempted intrusions on my system

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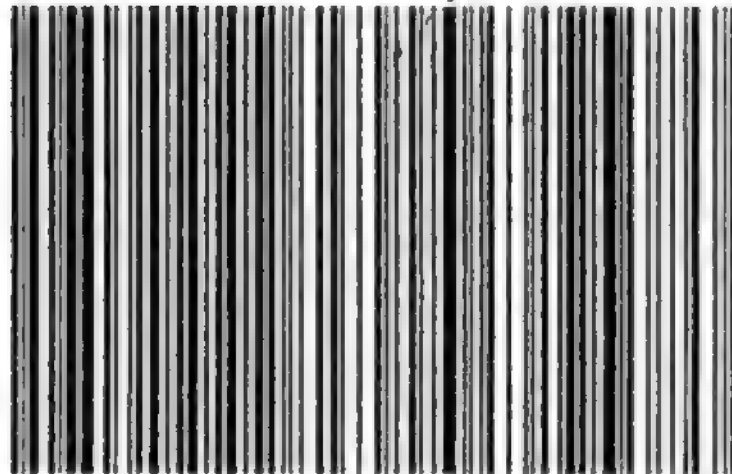
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1. Follow instructions on the other side

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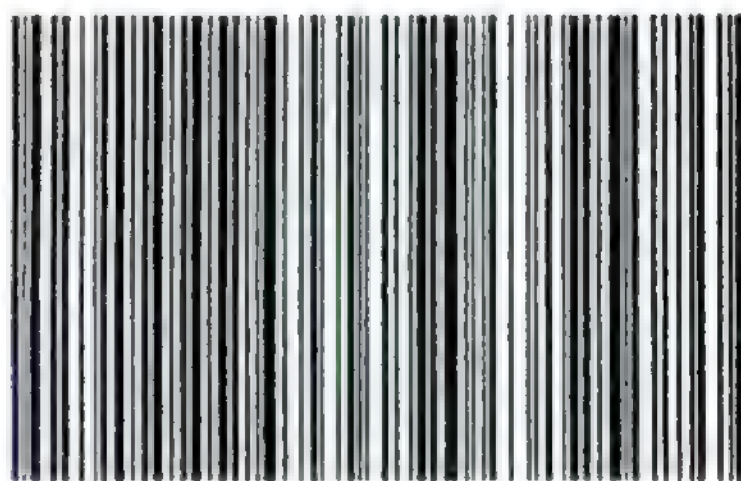
Gbs5lipBack-0018



Inverted Back

1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page

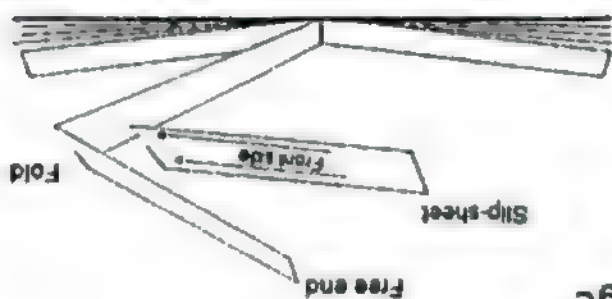
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



1. Open the foldout page

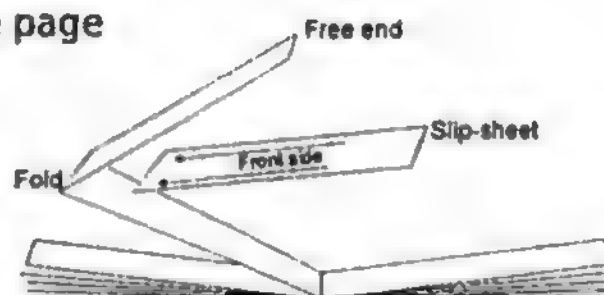
2. Insert this sheet with

1. Front side touching the free page

2. Arrow pointing to the fold

3. Slice the folded edge

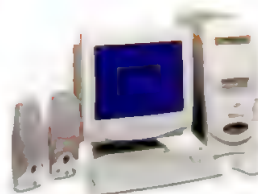
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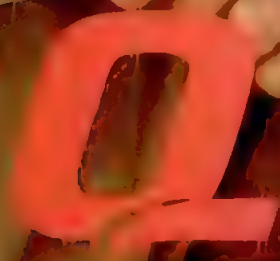
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Changing Dial-Up Properties

On a recent trip, I noticed that some areas of the country require you to dial an area code for local numbers, but without the 1 at the start. The Windows 95 dial-up connection dialog box seems to allow using the area code only if you are not in the area; then it adds the unneeded 1. From my hotel, for example, I needed to dial 9, then the area code and phone number. Is there any way to fix this?

John Cooper
via the Internet

You can solve this problem by changing your dial-up connection's properties as follows:

- Right-click *My Computer* and choose *Explore*.
- Double-click *Dial-Up Networking*.
- Right-click your connection and choose *Properties*.
- On the *General* tab, uncheck the box that mentions "use area code" (it may say *Use country code and area code* or *Use area code and dialing properties*).

Now Windows will dial precisely the number you enter in the *Telephone number* field.—Neil J. Rubenking

Limits of "Browse in Separate Process"

I set Internet Explorer to use the "Launch browser windows in a separate process" setting. But I learned that when you right-click on a link and select *Open in New Window*, the new window runs in the same process as the original. If the original window crashes, the new window crashes, too.

When I want to open a link in a new window, I launch the IE icon on the desktop and drag the link to the new window, which is running in a separate process. Now, if the original window crashes, the new window is unaffected.

H. E. Cane
via the Internet

In IE5, the setting in question is found on the *Advanced* page of the *Internet Options* dialog. Without this setting, every browser window is owned by the same process, and a problem in one can crash them all. As noted here, a window launched via *Open in a new window* belongs to the same process as the original. If you experience frequent crashes in IE, use this tip to contain the crash in a single browser window.—NJR

software check it first, and then only if you know the sender and were expecting the attachment. You basically erect a wall of distrust against all incoming executable software, whether attachments or downloads. You become very, very wary.

Turning off File and Print Sharing while you're on the Internet is particularly important. If you're using a cable modem, leaving this setting turned on could cause your computer to pop up as available when someone else on your network segment opens his or her Network Neighborhood icon. Even your most benevolent neighbor is bound to find that tempting.

But still, having an open porthole from your system into the vast unmanaged frontiers of the Internet makes you want to monitor every bit that traverses that opening. After all, if an interloper makes a subversion attempt, how else can you be sure to detect it? That's where intrusion detection, identification, and protection software comes in very handy. And that's why I started using a remarkable new product called BlackICE Defender (\$39.95 direct, www.networkice.com). The product detects and informs you of attempts to hack your system. It's brought a lot of visibility to what could happen on your Internet connection, and has introduced me, albeit at a great distance, to a hacker known as Killer.

BlackICE can be thought of as a personal intrusion-detection, identification, and countermeasure system. It watches all Internet protocol transmissions to and from your PC and can block malicious intrusions. The program also collects information on these attempts, some of which are shown in Figure 2. Unlike other packages of this sort, BlackICE does not require you to program sophisticated rules to tell it what to do, and you don't need any knowledge of TCP/IP ports or packet types to put it to work. The experts at Network ICE have built knowledge of over 200 intrusion techniques into the software, including all the most common ones, so that you only have to choose a level of security protection (see Figure 3) and let the program do the rest.

I put BlackICE to work for several weeks on a system using an ordinary dial-up V.90 modem connection. During that time, BlackICE detected numerous attempts to break into the com-

puter. Almost all of these intrusions were pings and probes sent to see whether the system had one of the required back-door programs in-

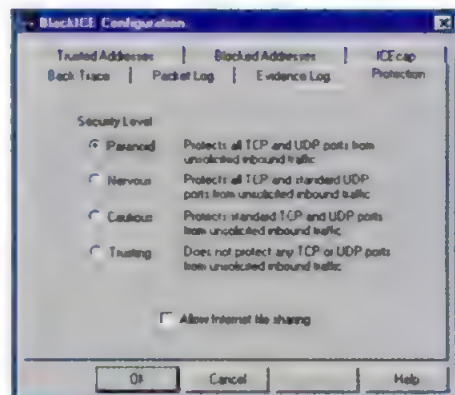


FIGURE 3: To determine your level of protection, you select one of four security levels.

stalled (it didn't). But because BlackICE has an identification component that does backtracking on suspected intruders, a rather interesting collection of data was assembled, which I was then able to use to do some sleuthing of my own.

As you can see from Figure 2, BlackICE collects the intruder's IP address and DNS name and identifies the attempt as a specific intrusion type. When possible, the software also tracks down the intruder's *node name* (machine name, Killer in this case), *group name*, and NetBIOS name, as shown in Figure 4. This information is of value to security experts in helping to identify intruders.

I started by attempting to identify Killer's ISP. First, I noted the domain name *as.wcom.net*, from the *lon-c45-017-vty41.as.wcom.net* DNS name identified by BlackICE. It was obvious to me that this was an MCI WorldCom domain, because I'm already familiar with the *wcom.net* suffix. When you're not sure, you can navigate online to www.networksolutions.com and do a *whois* search on the IP address identified by BlackICE. To search for a domain name such as *as.wcom.net* instead of an IP address, you enter *domain as.wcom.net*. When I did this, I was able to find *wcom.net* but not *as.wcom.net*, so I searched for the IP address instead.

There are a number of *whois* server databases containing information for the U.S., Europe, the military, and so on, so you might have to do several searches. I confirmed Killer as

having come through MCI WorldCom by finding the 195.232.10.42 IP address in the European IP address allocations database. The information returned by *whois* identified MCI World-

Time	Source	Destination	Port	Protocol	Service	IP	Group	NetBIOS	Node
1 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
2 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
3 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
4 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
5 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
6 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
7 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
8 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42
9 1999-09-01 14:10:15	195.232.10.42	195.232.10.42	80	TCP	HTTP	195.232.10.42	195.232.10.42	195.232.10.42	195.232.10.42

FIGURE 2: Selected data collected by BlackICE Defender about attempted intrusions on my system

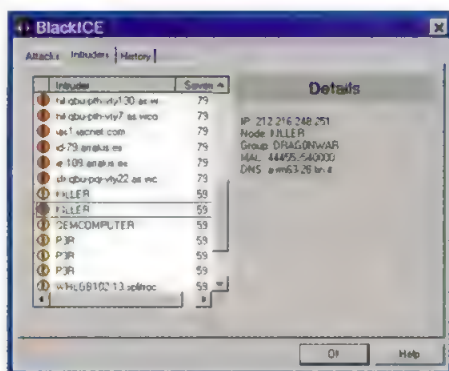


FIGURE 4: *BlackICE Defender includes technology that can help identify intruders.*

Com as the hostmaster for Killer's access.

Next, I obtained help from MCI WorldCom/UUnet's security department. They took the information from Figure 4 and, with the help of the security departments of several of UUnet's ISP customers, matched it against their traffic logs. With some effort, they determined that the network access points for the attacks were actually in Spain and Italy. In each case, a hacker such as Killer obtained illegal access to a legitimate ISP account, perhaps by tricking the

true account owner into revealing a password. That account then became the springboard for the pinging and probing detected by BlackICE.

In my case, each of the actual account holders whose ISP accounts were illegally co-opted was contacted and notified and the accounts had to be canceled and reestablished. In this way, Killer and the others were thrown out of their surrogate accounts and off the Internet, if only temporarily. What's fascinating—and a little disconcerting—is that I would never have been aware of Killer's attempts and many other similar attacks had I not installed BlackICE. This underlines the importance of this new class of intrusion detection and prevention software, and not just on corporate networks. Ultimately, I was unable to determine with certainty whether the intruder whose node name is Killer was a teenager playing games or a professional hacker, but I do know that I don't want just anyone to have access to my system.

Intrusion detection has become important to me. Sooner or later it probably will matter to you too. **PC**

Sal Ricciardi is a contributing editor of PC Magazine.

Accessing FTP Sites

I want to use my browser to enter non-anonymous FTP sites where I have my own username and password. Can I do this?

Gillian Tomasevic
via the Internet

Yes, you can. Although accessing anonymous sites using Netscape Navigator (any version) or Microsoft Internet Explorer (5.0+) is simply a matter of typing `ftp://siteaddress.com`, you can easily access nonanonymous FTP sites as well. In the *Location* field of Netscape or the *Address* field of IE, type the address of the FTP site in the form: `ftp://username@siteaddress.com`—use your real username, of course, and the actual address of the site. When the connection is made, you will get a dialog requesting a password; type your password in the box and you'll enter the site. As for the site address, keep in mind that although many FTP sites start with the prefix `ftp` (`ftp://ftp.netscape.com`, for instance), many do not. —NR

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Collaboration in Office 2000

Beyond mere comments: a mechanism for full-fledged discussions.—By Neil Randall

Microsoft has called its major suite *Office* for years, but the 2000 version finally recognizes that people in offices often work on projects collaboratively rather than individually. Making use of a server equipped with the Office Server Extensions (OSE), administrators can establish environments for collaborating on documents and Web pages in several ways, including sharing files and engaging in discussions of documents and pages in progress. Here we'll cover the various means of discussing Office documents and Web pages, including sharing information through Net Folders.

To make the best possible use of Office 2000's collaboration features, you need access to a server running the Microsoft Office Server Extensions (OSE). These extensions ship with Office 2000 Professional and Premium, and can be installed on Windows NT 4.0 Workstation

other team members to see. Another long-standing feature, available through the *Tools* menu, lets you track changes made to a document. Don't worry: These features still exist. The new features increase collaborative possibilities, but there's no need to abandon what you're already doing.

DOCUMENT DISCUSSIONS

There are two somewhat different types of discussions in Office 2000. In one, you discuss documents created with Office applications; in the other, you discuss the pages of Web sites. Officially, both are called *Web discussions*, because the feature makes use of a Web server. But for clarity's sake, we're separating them into *document discussions* and *Web page discussions*. (FrontPage users should note that the Discussions feature in Office 2000 has nothing to do with the creation of Discussion webs in

FrontPage.)

The document discussion feature is designed for a document available to several team members and stored on a server running OSE. Whenever a team member loads the document into the associated application, he or she can add to the ongoing discussion and then save the document back to the server for the other members to see.

Of course, you could use the tried-and-true Comments feature for this purpose. But discussions are more effective than a stream of comments in several ways: First, whereas comments are saved to the document itself, the discussions reside in a separate, multiuser database and don't affect the actual document. Because the document is preserved and the database is multiuser, all users in the workgroup could, in fact, add to the discussions simultaneously. Users can also be assigned to an NT group called Collaborators, which allows only those specific workers to

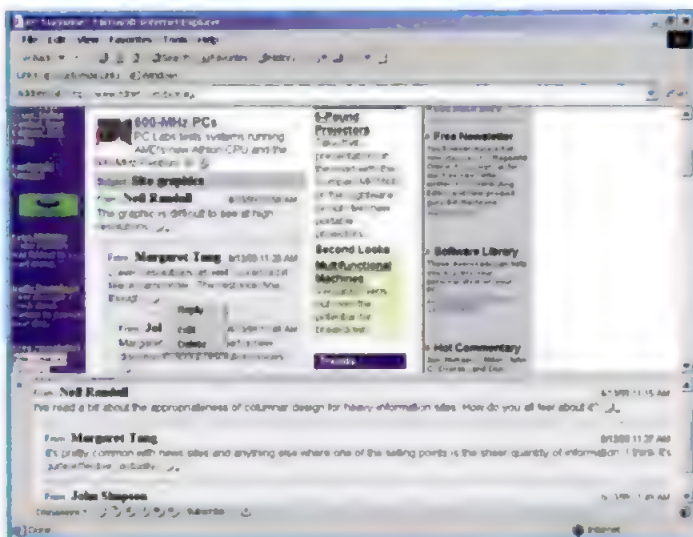


FIGURE 1: This Web page contains an in-line discussion below the 600-MHz PCs link and a general discussion in the discussion pane at the bottom.

running Personal Web Server 4.0, Windows NT 4.0 Server with Service Pack 4, or Windows 2000 running IIS 4.0 or higher. The extensions let users work with Office documents in an intranet-based fashion, which helps workgroups share and search for files and collaborate on documents.

Office has long had a *comments* feature (*Insert | Comment*) in which readers could add text blocks to the document for the author and

Omit Zeros from Average in Excel

I have a spreadsheet containing names of salespeople and their respective sales figures. How do I create a formula that will average a salesperson's sales figures only for the months he or she made sales and that will disregard the months without sales figures?

Mary Lowe
Memphis, Tennessee

The **AVERAGE()** function will ignore cells that are blank or that contain non-numeric data. Thus, one quick fix would be to use a blank cell instead of 0 for no sales. To calculate an average ignoring zeroes, you can sum the cells and divide by the number of nonzero cells. Suppose the data is in the range B2:B13; you could use this formula:

```
=SUM(B2:B13)/COUNTIF(B2:B13, ">0")
```

However, if a salesperson has zeroes in *every* month, this will generate a divide-by-zero error. To protect against that eventually, you can use an IF statement.

```
=IF(COUNTIF(B2:B13, ">0")>0, SUM(B2:B13)/COUNTIF(B2:B13, ">0"), 0)
```

This function returns zero if all cells in the range contain zero; otherwise it returns the average of all nonzero cells.—NJR

Tallying In-Range Cells

I have been trying for months to sort or filter my Excel spreadsheet. I have four columns—Name, Date_In, Date_Out, and Slots. I need to find out, when given a certain date, whether it falls between the Date_In and Date_Out. If it does, I then want Excel to count the slot column and provide a total at the end.

Amy Pellegrini
Chester, Vermont

The following formula in the Slots column returns 1 if Date falls between Date_In and Date_Out. Otherwise it returns 0.

```
=IF(AND(Date>Date_In, Date<Date_Out), 1, 0)
```

Enter this in the first Slots cell, replicate it to the bottom of the column, and

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use SUM to generate a total.

You can substitute the appropriate cell references for Date_In, Date_Out, and Date. Or, if you want to make your worksheet a little more elegant and readable, you can assign the names Date_In, Date_Out, and Date to the appropriate columns. Then you can write the formula as shown above, with name references instead of cell references. Even though the names are assigned to entire columns, not individual cells, each formula in the Slots column will reference only the cells in the same row, not the entire column. —Craig Stinson

Look Up Related Data in Excel

I have a list of stores that have corresponding sales information. I want to be able to select the top ten sales producers and list these stores separately in another area of my spreadsheet. I can retrieve the ranked sales info using the LARGE function, but how can I select the corresponding store number?

Randy Southern
Raleigh, North Carolina

Suppose sales figures are in A2:A51 and store numbers in B2:B51. Enter rankings 1 through 10 in cells D2 to D11. In E2, enter the following:

=LARGE(A\$2:A\$51,D2)

and in F2, enter

=VLOOKUP(E2,A\$2:B\$51,2,
FALSE)

Now copy E2 and F2 down into the next nine rows. VLOOKUP requires that the lookup data (sales figures) be to the left of the reported data (store numbers) and contain no duplicates.

You can avoid VLOOKUP's strictures if you're willing to create a range of partial results. We'll assume all the store numbers are below 10,000. In C2, enter this formula:

=A2*100+(B2/10000)

The integer part of the result is the sales figure in pennies; the fractional part is the store number. Copy that formula into C3:C51. In G2, enter =INT(LARGE(C\$2:C\$51,D2))/100 and in H2, enter this:

=MOD(LARGE(C\$2:C\$51,D2),1)
*10000

Then copy G2 and H2 down into the next nine rows. —NJR

view the ongoing discussions.

A Discussion originates when a member of the workgroup has a document open and selects the Web Discussions item from the Online Collaborations submenu in the Office application's Tools menu. A dialog box asks which OSE server to connect to (where the discussion database is stored). Once the connection has been made, the Discussion toolbar appears at the bottom of the Office document (it can be moved like any other toolbar).

This toolbar lets you insert a discussion into the document (*in-line discussion*), start a discussion about the document (*general discussion*), print the existing discussions, or subscribe to the discussions. All discussions appear at the bottom of the document in a newly created area called the *discussion pane*, where there's an icon for each discussion. Clicking on the icon lets you reply to, edit, or delete the discussion item (different users can be assigned different permissions), and replies are threaded to keep topics together. In-line discussion items are referenced in the text by a discussion icon that isn't interactive.

If you would like to be informed of changes to a discussion, click the toolbar's *Subscribe* button. The resulting *Document Subscription* dialog lets you subscribe to the document or its associated folder and specify what changes you want to be told about: These range from any changes at all to only the insertion of new discussion items. You can also specify an e-mail address to which notifications should be sent, and how frequently you want this information mailed to you.

WEB PAGE DISCUSSIONS

Web page discussions are similar to document discussions (a Web page is simply another kind of document). General discussions are identical, but in-line discussions behave quite differently. When you choose the *Insert in the document* option for a Web page, an icon appears beside each break in the document (paragraph break, end-of-table item, and so on). Each icon can lead to its own threaded discussion. The discussions appear in the Web page itself and the *discussions pane* is not created.

Web discussions work best with Microsoft Internet Explorer 5. Users of IE4 can start a discussion through the *View | Explorer Bar* command (but you still need an OSE server). If you use any other browsers (including Netscape Navigator), you can use the Web discussions feature by going to the Web page you wish to

discuss and typing the address of a server established by your server administrator as a place to save discussion files. If you don't have access to such a server, you can't use the discussion feature.

NET FOLDERS

Net Folders are simply Outlook folders whose contents are shared across the Internet. They require only Outlook (98 or 2000), not OSE. To set up a Net Folder, highlight a folder in Outlook's Folder List (choose *View | Folder List* if the list is not showing), and then share it by choosing *This Folder* from *File | Share*. The wizard will guide you through the process, but you're simply inviting specific e-mail addresses to use this folder for sharing information. You can share any folder you wish (but sharing your Inbox folder isn't recommended), and you can save outgoing and incoming mail directly to the shared folder.

Finishing the wizard sends a welcome message to the specified e-mail addresses and places the Folder in their version of Outlook. From that point on, any messages added, deleted, or edited by any participant will affect the Folder on everybody's machine. You can establish different levels of permission for each participant, ranging from the ability to read items all the way to editing and deleting privileges for any or all files in the folder. 

Neil Randall is coauthor of *Special Edition Using Microsoft FrontPage 98 (Que)* and a contributing editor of *PC Magazine*.

CRIB SHEET

Discussions aren't the only collaboration features in Office 2000. Here are others, and we'll look at some of them in more detail over the coming months:

Checking documents in and out. A team member currently working on a document can keep others from accessing that document by checking it out, and then can reestablish access by checking the document back in.

Protected webs. FrontPage webs can have their access restricted to specific usernames and passwords or to certain computer addresses and IP numbers.

Authoring permissions. FrontPage webs can specify users as browsers, authors, or administrators, each with its own capabilities for collaboration.

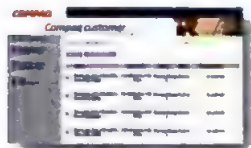
OSE administration. The Office Server Extensions tool gives administrators control over discussion and subscription settings as well as the database in which this information is stored.

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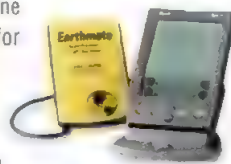
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FAT32 and Drive Partitioning

There's no real reason to have more than one drive now. Here's how to get rid of the extras.—By Neil J. Rubenking

PC Magazine has received hundreds of questions over the years from readers about partitioning hard disks. In the past year or so, the nature of those questions has changed. Readers used to ask about partitioning disks to avoid the size limitations inherent in the FAT16 file system, or to minimize wasted disk space. The FAT32 file system, however, supported by Microsoft Windows 95 OSR2 and Windows 98, doesn't suffer the limitations of FAT16; it's perfectly fine to format a drive of any currently available size into one huge partition under FAT32. So the majority of partitioning-related questions have shifted emphasis: Readers want to know how to get rid of their partitions now that they have FAT32. In this story, we review the reasons for going back to a single partition, and we explain exactly how to go about it.

WHY PARTITION?

The FAT16 file system was introduced with early versions of DOS. The original release of Windows 95 uses FAT16, and Windows NT supports

you find that a FAT16 partition can never be larger than 2GB. Thus with FAT16, any drive larger than 2GB absolutely must be divided into multiple partitions.

For a hard disk formatted with FAT16, cluster sizes are always a power of 2 kilobytes—2K, 4K, 8K, 16K, up to 32K. No matter what the nominal size of a file as reported by Explorer or the DIR command, the amount of disk space it occupies is measured in whole clusters. If the cluster size is 32K, every file from 1 byte to 32K uses up 32K of disk space. Assuming a random distribution of file sizes, the average *cluster waste* is one-half cluster per file. By dividing a large disk into multiple FAT16 partitions, you can reduce the cluster size and thereby reduce the cluster waste, providing a significant increase in available disk space. Suppose, for example, that you have a nearly 2GB disk, formatted with FAT16 and containing 32,768 files. Average cluster waste is one-half of 32K, or 16K per file. That comes to 512MB of wasted space—one quarter of the disk! Dividing the same disk into two nearly 1GB partitions would reduce the wasted space by half, gaining you 256MB.

The size-limitation and cluster-waste problems go out the window with FAT32. For a detailed introduction to FAT32, see the article "An Enhanced File System for Windows 95," in our issue of April 8, 1997 (www.pcmag.com/pctech/content/16/07/os1607.001.html). FAT32 supports vastly larger disks than now exist, and substantially reduces cluster waste. FAT32 uses a 32-bit file allocation table, bypassing the limit of 64K clusters. It potentially supports partitions from 512MB to 2TB—that's two terabytes, or 2,048GB. Cluster size ranges from 4K to 32K, but the cluster size is much smaller in proportion to the partition size. Figure 1 shows a comparison of FAT16 and FAT32 cluster sizes for different partition sizes.

There are reasons for partitioning a drive other than avoiding cluster waste. Power users may maintain separate partitions to permit booting to multiple operating systems. Others keep the operating system on one partition, all applications on another, and data files on yet another. This lets them easily maintain separate backup schedules for different types of files. They may back up the data partition daily, the application partition weekly, and the operating

FAT16 vs. FAT32

Partition size	FAT16 cluster size	FAT32 cluster size
Up to 128MB	2K	N/A
128MB to <256MB	4K	N/A
256MB to <512MB	8K	N/A
512MB to <1GB	16K	4K
1GB to <2GB	32K	4K
2GB to <8GB	N/A	4K
8GB to <16GB	N/A	8K
16GB to <32GB	N/A	16K
32GB or more	N/A	32K

N/A—Not applicable. The file system does not support such partitions.

FIGURE 1: The FAT32 file system supports much larger disks than FAT16 does, and the cluster size is much smaller in proportion to the partition size.

it (along with the more advanced Windows NT File System). This file system, using a 16-bit file allocation table (hence the name FAT16), tracks the areas of disk space allocated to each file. There are only 65,536 (64K) distinct 16-bit numbers, so a partition formatted using FAT16 can have at most 64K units of allocation, called *clusters*. The maximum size for a cluster is 32K. Multiply that by a maximum of 64K clusters, and

No TweakUI in Windows 98 SE

I just purchased a new system that includes Microsoft Windows 98 Second Edition but not TweakUI, which I consider a must-have utility. Can you tell me how to obtain it?

Michael Mack
via the Internet

TweakUI is a free tool supplied but not supported by Microsoft. They removed it from the Windows 98 SE CD to clarify its unsupported status. You can still download the set from Microsoft (www.microsoft.com/Windows95/downloads/contents/WUToys/W95PwrToysSet/utility) or your favorite download site and install TweakUI under Windows 98 SE, even though the program is for Win 95. Place the downloaded file in a new folder that doesn't include long filenames: C:\PowerToy is fine, but not C:\Program Files\Power Toys. Launch the file; it will expand into several dozen other files. Right-click the file TweakUI.inf and choose *Install* from the pop-up menu.—NJR

Use Playlists with Media Player

Many people use the Windows Media Player as the default application to play audio files (such as MP3 or RealAudio) that they download from the Internet. An undocumented feature of Media Player is its ability to play a list of preselected audio files. To create such a list, open Notepad and simply type the complete path to each song you want Media Player to play. Then save the file, using *.m3u* as the extension. When you launch the file, Media Player will play your list of audio clips one after the other.

If you have the Send To extensions from Microsoft's Power Toys installed, it's even simpler to create a playlist file. Select the audio files in Explorer, right-click on them, and choose *Send to Clipboard as Name*. Then paste them into Notepad and save with the *.m3u* extension.

Ron Vanover
Media, Pennsylvania

This is a very handy way to play a sequence of audio files, and you can even include URLs in addition to local filenames in your M3U playlist. Of course, if you want to play a song again and again, you should probably download it and play the local copy.—NJR

Restore a Registry Backup

If my Windows 95 Registry gets trashed, is there any way to recover it?

Nisheel Poddar
Bombay, India

Registry data is stored in the read-only, hidden system files `System.dat` and `User.dat` in the Windows folder. They are regularly backed up to `System.da0` and `User.da0`. To restore these backup files, restart in MS-DOS mode and navigate to the Windows folder. Then enter the following commands:

```
attrib -r -s -h system.da?
ren system.dat system.bad
ren system.da0 system.dat
attrib +r +s +h system.dat
attrib -r -s -h user.da?
ren user.dat user.bad
ren user.da0 user.dat
attrib +r +s +h user.dat
```

Now restart the system. After you confirm that the Registry problem has been fixed, you can delete the `System.bad` and `User.bad` files. —NJR

Recovering Data

After I ran ScanDisk, a number of image files disappeared and some CHK files were created. Can I recover the pictures?

Carlos G. Torres Ortiz
Mayaguez, Puerto Rico

A CHK file contains complete or partial file data that has been disconnected from its file. The sooner you try recovery, the better your chances. Suppose you lost three JPG files, and found three files named `FILE0000.CHK`, `FILE0001.CHK`, and `FILE0002.CHK`. Rename them using the .jpg extension. If you can now open them, the files are complete. If not, they're useless and should be deleted.

If you lost files of various types, try loading each CHK file into WordPad. The first few characters of the file may identify it:

BM	BMP
GIF	GIF
JFIF	JPG
MZ	program
PK	ZIP

Of course, you must not save the file in WordPad! If you can determine the file's type, rename it with the right extension and try to open it with the appropriate application. —NJR

system partition less often. With disk size nearly unlimited and cluster waste vastly reduced, however, most users just don't need multiple FAT32 partitions.

UNPARTITIONING

So now that you're using an operating system that supports FAT32, how do you restore your chopped-up hard disk to one single, simple FAT32 partition? First, you'll need a non-destructive partition utility. The two contenders are Partition Commander (\$39 list) from V Communications (www.v-com.com), and PartitionMagic (\$69 list) from PowerQuest (www.powerquest.com). (Interestingly, PowerQuest indicates that the next version of PartitionMagic 5, available soon, will include the ability to merge FAT16 and FAT32 partitions automatically).

You'll also need a utility to notify the system that files have moved from one address to another, for example, from `D:\Program Files` to `C:\Program Files`. You can use *PC Magazine's* COA32 (Change of Address, 32-bit) utility for that purpose. You'll find COA32 in the *PC Magazine Utilities Index* at www.pcmag.com/utilities.

Before you begin, make a complete backup of all partitions. Now check to be sure that partition C: is formatted with FAT32. Double-click My Computer, right-click drive C:, and choose *Properties*. You should see *File system: fat32*. If not, use your partition utility to non-destructively convert partition C: to FAT32. Don't bother with the Windows 98 FAT32 conversion program; the partition utilities do the job more reliably.

For the sake of illustration, we'll assume the drive in question has been partitioned into C:, D:, and E:. Start by using the Windows Defrag utility on the last one, partition E:. This serves to put all the unused space at the end of that partition. Now use your partition utility to shrink partition E: as much as possible. Move partitions E: and D: so that the resulting free space is directly above C: Finally, enlarge partition C: so it incorporates all the free space. The process will look similar to the one in Figure 2, depending on your configuration and the partition utility you use. Also depending on the utility, it may be possible to shrink partition E: and assign the freed space to partition C: in a single step. Either way, the process can take 5 to 10 minutes or even longer. When it finishes, exit the partition utility.

Back in Windows Explorer, copy one complete folder from E: to C:. To do so, right-drag a

folder from the root of E: onto the C: icon and choose *Copy here*. When the copy process is complete, double check that the folder's contents were copied completely, then delete the folder from E:. Copy another folder, and another, until there's no more room on C:. You'll probably wind up with a partially copied folder on C:. Delete that folder from C: and leave the corresponding folder on E: intact.

Now right-click the Recycle Bin icon on the desktop and choose *Empty Recycle Bin*. Again, defragment partition E:, use the partition utility to shrink partition E:, and move the freed space into partition C:. You may have to repeat this cycle several times, but eventually you will have moved all files and folders from partition E: to partition C:. Now you can use your partition

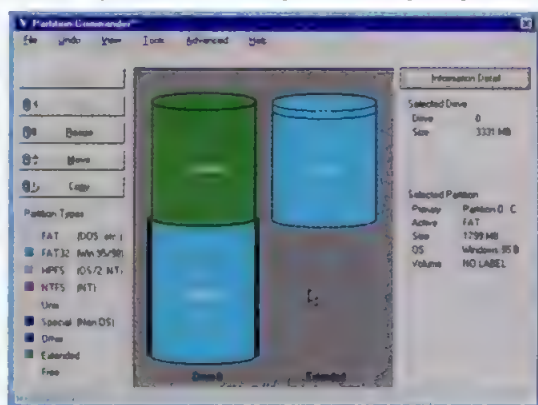


FIGURE 2: Here, almost all of partition E: has been moved into partition C:.

utility to delete partition E: entirely.

At this point, you must inform Windows about the massive change of address that has occurred on your hard disk. Every file that used to reside on drive E: has moved to drive C:. Launch COA32 and enter `E\` for the `Old:` address and `C\` for the `New:` address. On each of the option pages, select the most comprehensive choices—*All ini files in all folders*, *All shortcuts in all folders*, and *All of the Registry*. COA32 will search your system, gathering a list of INI file keys, shortcut links, and Registry keys that include the old address. Review this list and click the *Save List* button to save it to a file for future reference. After COA32 changes all of the found references to use the new address, save its activity log to a file, too.

Whew! You're halfway done. Your drive now has only two partitions, C: and D:. Just repeat all of the steps for D: that you did for E:. When you're all done, your hard disk will consist of one big, happy FAT32 partition. ☐

Neil J. Rubenking is a contributing editor of *PC Magazine*.



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**What are you
waiting for?**

Communicating with Active Directory

ADSI lets applications interact with directory services without having to deal with the internal details.—By Keith Pleas

ADSI (Active Directory Service Interfaces) is more than just an interface into the Active Directory. Although ADSI—currently at Version 2.5—is included in Windows 2000, it is also available on Microsoft's Web site (at www.microsoft.com/adsi) for Windows 95, Windows 98, and Windows NT 4.0. ADSI is a COM-based programmability layer for directory services, and when installed on a client machine, it allows that machine to work with objects in each of four major namespaces that correspond to underlying network providers:

- LDAP—Lightweight directory access protocol, Version 2
- WinNT—Microsoft Windows NT
- NWCOMPAT—NetWare 3.x
- NDS—NetWare 4.x

The LDAP namespace provider can be used to access any LDAP server, particularly Mi-

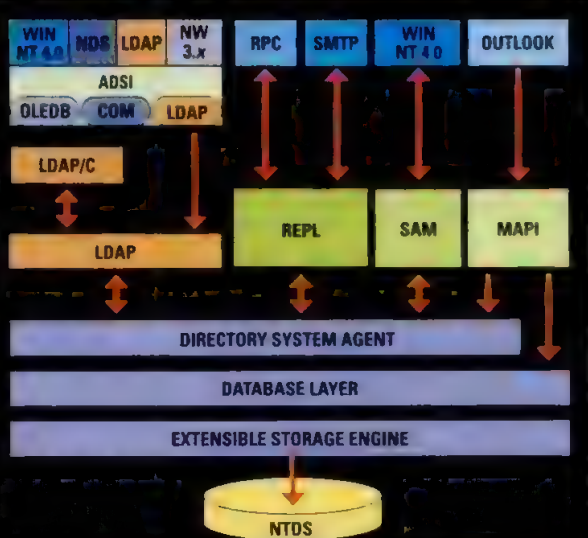
Windows NT Server or Client Services for NetWare for Windows NT Workstation installed on the client machine. It is also possible to provide ADSI capabilities for other—nondirectory—interfaces, as Microsoft did with recent versions of Internet Information Server (IIS).

Under the hood, the ADSI router (activeds.dll) sits between the client and the ADSI providers. It implements a core set of objects, features, and services common to all the providers. Unfortunately, although the names of the providers themselves have been standardized, each of the providers has its own syntax for accessing member objects.

Perhaps the simplest way to experiment with ADSI is to write Windows Scripting Host (WSH) scripts using VBScript. Here's an absolute bare-bones script to enumerate the ADSI providers on a client machine:

Active Directory Layered Architecture

The Active Directory is designed around a layered architecture. Most directory access—as with ADSI—is through LDAP, which also provides NDS, NetWare 3.x, and Windows NT 4.0 directory services. Additional methods for accessing the Active Directory are provided for the Directory Replication Service, for backward compatibility with Windows NT 4.0's Security Accounts Manager (SAM), and for a messaging-based system for integration with existing Exchange and Outlook clients.



crosoft's new Active Directory but also Internet-based directory services like Bigfoot, InfoSpace, and WhoWhere. Starting with Version 5.5, Microsoft is also providing an LDAP interface to Exchange. This makes synchronizing between like directory services easier. The WinNT provider works with accounts, groups, and services in existing Windows NT 4.0 domains (which Windows 2000 also emulates for upward compatibility). To use the NetWare providers, you'll need to have either Microsoft's Gateway Service for NetWare for

```
Set adsNS = GetObject("ADS:")
For Each obj in adsNS
    sMsg = sMsg & obj.Name & Chr(13)
Next
WScript.Echo sMsgcode
```

The first line obtains a reference to ADSI, the For...Each loop iterates through the namespace collection and concatenates each name onto a string, and the last line displays a dialog listing the results.

Accessing directory objects using LDAP requires an understanding of where those ob-

Browser Helper Object Bug

In Version 4, Microsoft Internet Explorer offers developers a way to extend the browser's capabilities: the Browser Helper Object (BHO) technology. A BHO is a COM object that can add new features to IE. These objects are installed under the Registry key HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Explorer\Browser Helper Objects. When you open a new window, IE enumerates the BHOs listed under this key and loads the relevant DLLs.

This mechanism worked fine until IE5 was released. IE5 loads only one BHO. Which one depends on the installation order and the CLSID value identifying the object. If you have more than one BHO installed and you're running IE5, you'll have to select the one you want and uninstall the rest.

Patrick Philippot
Draveil, France

Mr. Philippot discovered the BHO problem while developing the BHO-based utility FormWhiz for *PC Magazine*. Many popular enhancements for IE rely on the BHO technology, most notably the Alexa navigation service. Other popular BHO-based utilities include GoZilla, the New York Times Explorer Bar, ThirdVoice, and WinWeather.—Neil J. Rubenking

JavaScript Bookmarklets

You've heard of applets and scriptlets, but have you encountered bookmarklets? A bookmarklet is a tiny JavaScript program that fits completely within the URL of a bookmark. Building on a concept suggested in Netscape's *JavaScript Guide*, JavaScript enthusiast Steve Kangas has assembled a collection of over 150 bookmarklets for Netscape and IE, available free at www.bookmarklets.com. If you see one you like, just add it to your bookmarks collection.

When you launch a bookmarklet, it runs in the context of the browser. Standard objects like screen, document, and location give it access to useful information. Here's an example: javascript:void(location.

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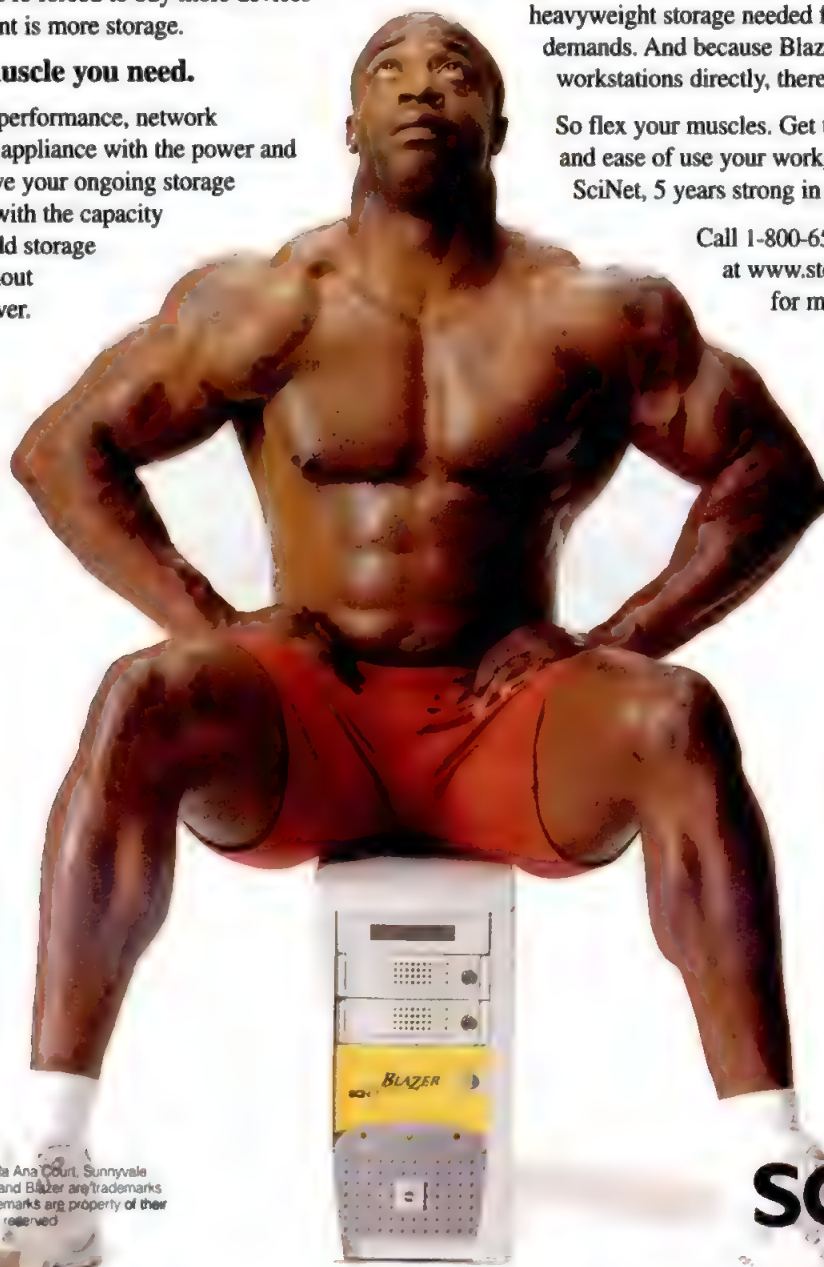
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jects are located and how they are named. In general, all objects are organized in a single hierarchy that in most cases ultimately ties into the Internet Domain Name System (DNS). For instance, *curlw.com* is a subdomain under the *.com* (for *commercial*) domain. Although it's possible to create further subdomains, a more interesting option is to create additional structure within a subdomain. In Microsoft's Active Directory, this is done by creating a hierarchy of containers—typically organization units (OUs)—within a single Windows NT-style domain. Thus, the *curlw.com* domain could be organized into East and West branches that map to separate OUs, each with a container for users.

The most familiar naming systems specify directory entries with the rightmost element having the greatest scope, leading to domain names like *ci.bellevue.wa.us* for my home city or *users.east.curlw.com*, using my previous example (if the users were placed in a separate subdomain). In LDAP each of the components used to locate an object is specified by attribute and value pairs. Thus, an LDAP string to reference the users container in the East OU in *curlw.com* would look like this:

```
cn=users,ou=East,dc=curlw,dc=com
```

You might also run across an alternate syntax, where the attribute pair order is reversed and the elements are separated by forward slashes rather than commas:

```
dc=com/dc=curlw/ou=East/cn=users
```

Using ADSI, it's only necessary to prepend the namespace and server names, such as:

```
LDAP://ServerName/cn=users,ou=East,dc=curlw,dc=com
```

The server can be specified using its DNS name or IP address, and the port number can be added on using a colon as a separator. Hence, since 389 is the default LDAP port, if the IP address of the server is 10.0.1.31, the following are all equivalent:

```
LDAP://ServerName/...
```

```
LDAP://ServerName:389/...
```

```
LDAP://10.0.1.31/...
```

```
LDAP://10.0.1.31:389/...
```

Being able to specify the port is handy in those cases where a server has two LDAP services—the Windows 2000 Active Directory and Exchange Server, for instance. Obviously, both directory services couldn't use the same port!

Putting all of that together, then, here's another small script that enumerates all of the objects—including containers like Users—in our imaginary East OU:

```
Set adsObj = GetObject("LDAP://ServerName/ou=East,dc=curlw,dc=com")
For Each obj In adsObj
    sMsg = sMsg & obj.Class & Chr(9) & obj.Name & Chr(13)
    iCount = iCount + 1
Next
WScript.Echo iCount & " objects in East OU:" & Chr(13) & sMsg
```

After obtaining a reference to the specific container—the East OU—we're interested in, we iterate over its objects, building a long message and simultaneously counting the number of objects. Though this small routine might not seem

useful in itself, the technique behind it forms the basis for virtually all tools that explore directories: Obtain a reference to the top-level object, iterate over its children, and repeat until done. Of course, you can add new objects or delete those that already exist. Or once you find the object you're interested in, you can change its properties.

The most difficult task in programming a directory is figuring out the exact syntax for a

particular object and its properties. Though each directory service generally requires specialized knowledge, a few tools will prove particularly helpful when working with the Active Directory. The first tool—Active Directory Users and Computers—comes with Windows 2000. By default, this tool hides the information you need, though, so you have to choose *Advanced Features* from the *View* menu before the *Object* tab becomes visible on the objects you are examining. The second tool is the ADSI Editor snap-in for the Microsoft Management Console (MMC), which comes with the Windows 2000 Resource Kit. Finally, you might want to investigate the ADSI Viewer that comes with the ADSI SDK. Although the interface is something that only its developer can love, it can be handy once you figure out how it works.

ADSI is an extremely useful extension to Microsoft's 32-bit Windows operating systems: It lets developers write applications and administrators write scripts that take full advantage of the built-in directory services in Windows NT and, more significantly, Windows 2000 servers. The same techniques can be used to provide programmatic control over other LDAP-based directory services. See the online version of this story at www.pcmag.com for more information. **PC**

Keith Pleas is a frequent contributor to PC Magazine.

```
href=location.href.
substring(0,location.href.
substring(0,location.href.
length-1).lastIndexOf
('/')+1))
```

The bookmarklet above navigates one directory up from the current URL.

You'll be surprised at the power packed into these tiny programs. There's one to highlight all occurrences of a given word on a page, for example, as well as a mathematical expression evaluator. Another displays the stored cookie for the current site. There's even a bookmarklet editor in the form of a bookmarklet! It takes JavaScript expertise to write bookmarklets, but anybody can use them. —*NJR*

Shuffling Values in VB

I'm a novice trying to teach myself Visual Basic 5. I have devised a project in which my program will select questions from a question pool. I've been able to program everything so far, except I don't know how to select questions and their answers randomly—say, 20 questions from a pool of 50.

Tommy Lee Fields
via the Internet

You need to shuffle the 50 items into a random order; then choose the first 20. Suppose you have your 50 items stored in an array named *A*. To shuffle them, you will start at the last index in the array and work toward the first. For each, you will swap the value at that index with a randomly chosen value at or below that index. Here's how you'd do it in VB:

```
For i = 49 To 1 Step -1
```

```
    j = Int(Rnd * i)
```

```
    Temp = A(i)
```

```
    A(i) = A(j)
```

```
    A(j) = Temp
```

```
Next i
```

Your program should call *Randomize* in its *Form_Load()* event handler to initialize the pseudo-random number generator. —*NJR*

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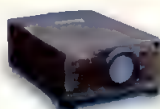
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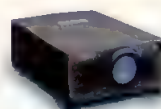
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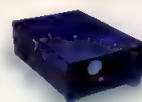
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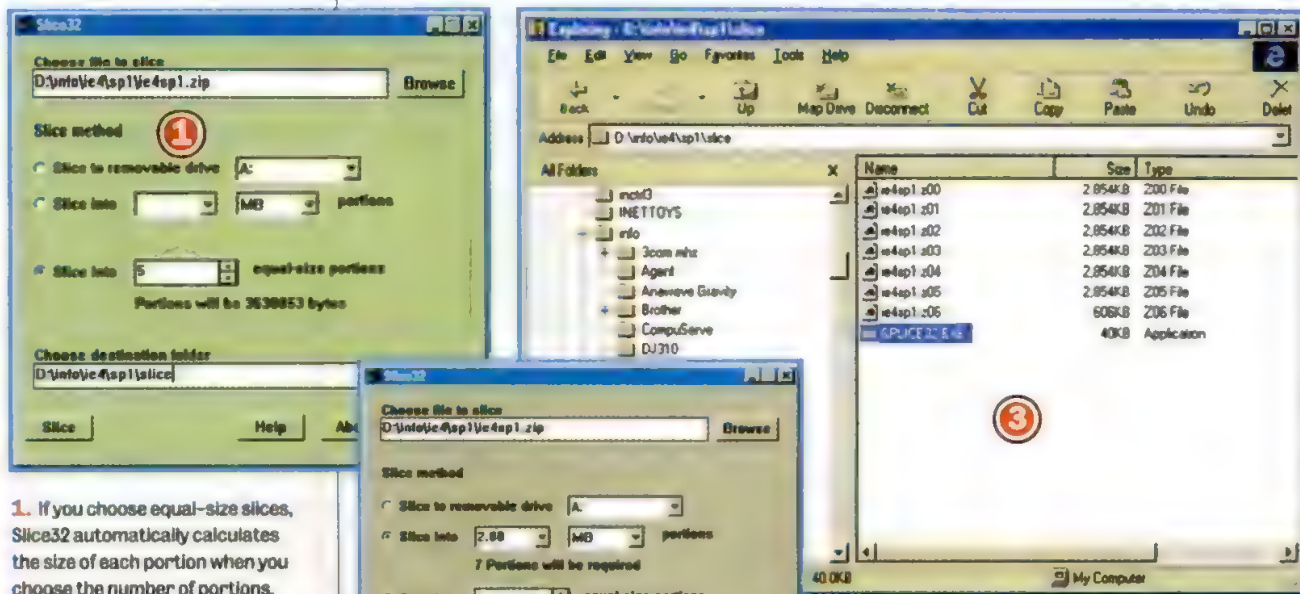
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Divide and Conquer

For easier transport, slice large files into smaller pieces, then splice them together again.—By Paul Trout



1. If you choose equal-size slices, Slice32 automatically calculates the size of each portion when you choose the number of portions.

2. Slice32 offers three slicing methods. You can slice directly to a removable drive or store the pieces on your hard disk in one of two ways: choose from preset slice sizes or specify a number of equal-size pieces. The preset size options correspond to standard disk media capacities.

3. When Slice32 writes out the file slices, it also copies the splicing utility (splice32.exe) to the destination location. To reconstruct the original file, simply launch splice32.exe.

The size of program and data files doesn't usually matter, but if you need to move these files from one machine to another, size can become a huge obstacle. If machines aren't networked, the only way to transport them is through *sneakernet*, which means the files must fit on removable media like floppy or Zip disks.

Smaller files are also preferable for online distribution because of data errors and lost connections. This issue's utility, **Slice32**, lets you slice files into manageable pieces for easy transport and distribution. Slice32 is an update to the *PC Magazine* utility *Slice*, first published in our issue of May 16, 1989.

Slice32 runs under Windows 95, Windows 98, and Windows NT 4.0. An article about how to use Slice32 and how it was written is available on our Web site at www.pcmag.com/utilities. A link to download the utility and its C source code can also be found there.

HOW TO GET THE FILES

PC Magazine utilities and other Solutions files are available on the Internet and by mail.

Via the Internet: Go to the *PC Magazine* home page at www.pcmag.com and click on Downloads, or use our FTP server at ftp.zdnet.com/pcmag.

Via Mail: You can request utilities by fax at 978-772-7133 or write to *PC Magazine* Utilities, c/o Image Software Services, 67 Buena Vista St., Ayer, MA 01432-5030. There is a limit of six disks per month.

Support: To obtain help for *PC Magazine*'s free utilities, visit our online discussion area on the Internet (www.pcmag.com/utilities/support.html).

Paul Trout, the author of *Slice32*, is a technology coordinator at Colorado State University. Sheryl Canter is the editor of the Utilities column and a contributing editor of *PC Magazine*.

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Versa LXi Notebook

NEC Computer Systems Division (NEC CSD) has introduced a full range of innovative new products designed to meet the needs of enterprise users.

These computing solutions — including new Versa® notebook computers, PowerMate® 2000 microdesktops, PowerMate ES 5250 Series of desktop computers, and the powerful

Express5800™ HV8600 eight-way SMP server — add to the line of existing NEC CSD

products. NEC CSD is cooperating closely with Microsoft to deliver reliable solutions, based on the NT Workstation and Server 4.0 platforms, to its business customers.

NEC Corporation, with its \$40 billion in annual sales, and a 100-year tradition of developing leading-edge business solutions, is the source of NEC CSD's customer centered products. NEC CSD has been a leader in deploying such advances as active-matrix displays, Local Bus video, power management in desktop PCs, and Wake-on-LAN and remote management.

NEC Corporation's extensive resources include the design and fabrication of advanced electronic components. This allows NEC CSD to supply its business customers without the delays often experienced by other suppliers who are dependent on third-party sources. NEC is also the world's second-largest manufacturer of semiconductors and one of the three strongest in new patents worldwide.

While NEC CSD offers computers pre-loaded with either Windows 98® or Windows NT® Workstation, NEC CSD recommends purchasing its desktop and notebook PCs pre-loaded with NT Workstation 4.0 to achieve maximum performance in a business environment. NT Workstation is Microsoft's most reliable and robust Windows operating system yet. Running NT Server on server hardware and NT Workstation on mobile and desktop PCs allow organizations to use one standardized operating system solution. And as the computer industry's major operating systems evolve, NEC technology will evolve as well, bringing scalable and affordable business solutions to enterprise users for years to come.

NEC

MOBILE PRODUCTS

Solutions for Road Warriors and Telecommuters

The increasing number of employees who work on the road or at home have come to expect the same computing power and access to information they typically have available through desktop systems. NEC CSD's flagship Versa® products not only function as desktop replacements, but also provide innovative mobile solutions to the growing ranks of telecommuters.

Because each user's requirements are different, Versa notebooks come in a wide variety of configurations — from lightweight 3.5 lb.¹ models to robust corporate workhorses with 15.0" LCD screens. In addition, when running Windows NT Workstation, the notebook is able to run software applications up to 30 percent faster than Windows 98 with a higher degree of reliability — Windows NT fail-safe features allow the system to continue to run even if one application crashes.

Corporate users can choose from four Versa notebook lines — the Versa LXi, Versa FX,² Versa VX and Versa SX — which can then be custom tailored to meet each user's requirements. In addition to notebooks, NEC CSD offers MobilePro™ industry-leading Windows CE-based handhelds.

Versa LXi — Designed as either a desktop replacement or a mobile computing solution, the Versa LXi has been designed from the ground up to support the maximum output of the fastest existing and future Intel® Pentium® III mobile processors. The active-matrix display provides up to 15.0" of brilliant color at XGA (1024 x 768) resolution. The Versa LXi is also designed for maximum configurability, supporting VersaBay III options such as the SuperDisk™ 120MB³ drive, second hard drive, second battery, DVD, CD-ROM, or CD-RW (estimated availability: Q1-2000).

The Versa LXi is the proud successor of the award-winning Versa LX line, which was named by *PC Computing* as "Best Overall" desktop replacement notebook in its April, 1999 annual Torture Test. This notebook is particularly suited to the needs of marketing professionals, software developers, training professionals,

engineers and other power users who need a rugged, reliable system on the desktop or on the road. When pre-installed with Windows NT Workstation 4.0 the Versa LXi will satisfy the most demanding business user by providing a system engineered for performance and reliability.

Versa SX — The full-featured NEC Versa SX features up to 14.1" panels, yet weighs only 4.8 lbs.⁴ and is just 1.3" thin. The internal VersaBay III slot holds DVD, CD-ROM, SuperDisk, second battery, or second hard drive. This multimedia notebook is part of the "universal" notebook family, featuring accessories and docking solutions that work with the Versa SX, LX and LXi

Versa FX — Although it weighs only 3.5 lbs.¹, the unique design of the Versa FX delivers a full-size keyboard (18.8 mm key-pitch) and a full-size 12.1" TFT display to provide comfort and maximum usability in an ultra-portable notebook. The system represents the latest in innovative NEC designs created specifically for the highly mobile worker.

Versa VX — The NEC Versa VX notebook delivers features, convenience and value in a sleek 1.6" chassis. This all-in-one system has been created specifically for MIS departments that want to roll out an affordable, reliable computer to large numbers of mobile users. All new Versa notebooks use innovative Mini PCI technology.

MobilePro Handheld PCs — Powered by an NEC-designed MIPS processor and the Microsoft Windows CE operating system, the MobilePro 770 and 800 are light and compact enough to take practically anywhere. They boot up instantly for no-wait note taking on a color display — 8.1" on the MobilePro 770 and 9.4" on the 800 — and feature pre-installed Pocket versions



Versa Notebooks L to R: LXi, VX, FX

of key Microsoft applications, including e-mail, word processing, spreadsheets, and Personal Information Manager (PIM). Back at the office, it's easy to synchronize data between the MobilePro and a desktop or notebook computer. And, most importantly, you can use the MobilePro for thin client and Web-based applications, running desktop, server, and Internet applications from any place where you have a phone line or network connection.

NEC PowerMate ES 5250 (Enterprise Solution) Series — NEC has created technology that leverages a single scalable motherboard across three chassis form factors (small desktop, desktop, and minitower) to provide a simplified enterprise-wide solution. This approach can help manage the total cost of ownership related to software development, support, service, training, and logistical costs.

The PowerMate ES Series offers a flexible computing solution designed for networked environments. The ES Series is optimized by using proven technologies that make it simpler for IT to manage large-scale rollouts and ensure maximum compatibility among different configurations. Windows NT Workstation 4.0 operating system plays a key role in achieving these ambitious business goals. The ES Series is available with selected Pentium III, Pentium II and Celeron™ processors, thereby allowing companies a variety of options based on user needs.



MobilePro 770 Companion



ES 5250 Series

1988	1989	1992	1993	1994	1994	1995
NEC UltraLite® 4.4 lb. notebook introduced.	ProSpeed® CXS color display laptops begin shipping.	UltraLite SL/25C active-matrix color display notebooks launched in the U.S.	NEC Corporation patents Local Bus video technology and implements it into PC products.	Versa M Series offers an active-matrix screen displaying 16.7 million colors.	Versa M with 800 x 600 resolution introduced.	Versa P notebooks ship with Intel Pentium processors.

DESKTOP PRODUCTS

Space-Saving Solutions on the Desktop

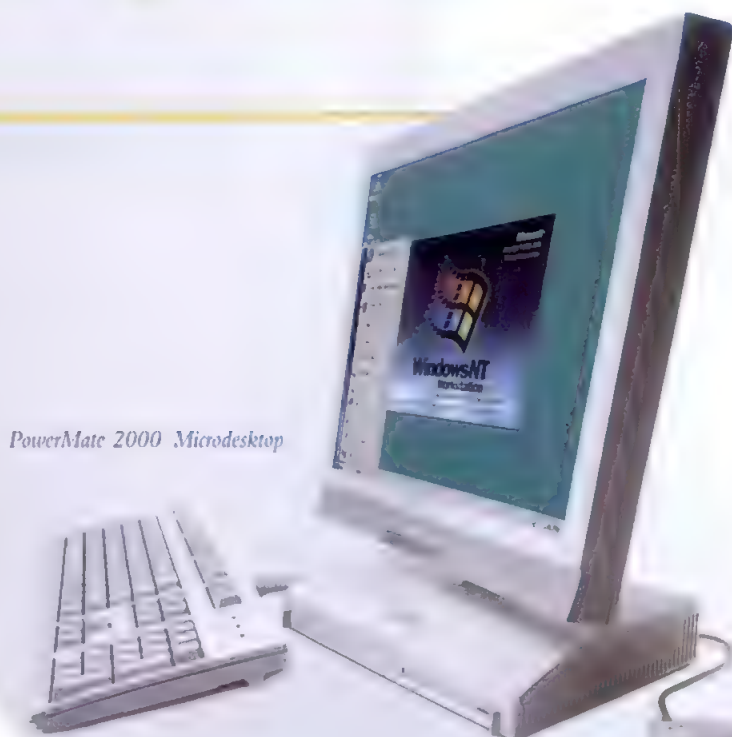
With its PowerMate[®] 2000 Series, NEC has created groundbreaking technology based on lessons learned in engineering the Versa line of notebooks. The result is a new microdesktop form factor, a system with capabilities similar to a full-size desktop computer.

The PowerMate 2000 PC has a footprint smaller than a sheet of paper (only 10.6" by 7.5") — about seven times smaller than the typical desktop system. An Intel Celeron 433MHz processor provides the speed needed for computing-intensive and high-bandwidth environments such as Internet and intranet access. The PowerMate 2000 runs both Windows 98 and Microsoft's Windows NT Workstation (for added reliability and speed). When pre-installed with Windows NT Workstation 4.0, PowerMate 2000 Series gives your business an ideal combination of advanced desktop performance coupled with comprehensive desktop manageability, which can help decrease your total cost of ownership.

The PowerMate 2000 Series is particularly adapted to today's working environments, where space is often at a premium — crowded sales offices, cubicles, kiosks, trade show booths, training centers and financial facilities. The system's ultra-bright 15.0" TFT flat-panel display allows viewers to see the screen image from a variety of angles, an important factor in consultative selling situations.

NEC CSD and Windows 2000

NEC CSD is actively involved in testing Windows 2000 Professional, the successor of Windows NT Workstation 4.0 as the business operating system from Microsoft, and Windows 2000 Server to ensure that its



PowerMate 2000 Microdesktop

customers will have a smooth migration when the new operating system becomes available. NEC CSD is enrolled in the Windows 2000 READY PC program put in place by Microsoft to make sure its high-performance business notebook and desktop PCs are ready for the future. To learn more about our participation in the initiative and about the hardware that qualifies for participation please visit our Windows 2000 READY PC Web site at: <http://www.nec-computers.com/Win2000/Ready>

to meeting the changing computing needs of its enterprise and small-to-medium size business customers. Call 1-877-207-7866 or visit our Web site at <http://www.nec-computers.com> to learn more about NEC CSD products and solutions. To find out about Microsoft current and future operating systems shipping on notebooks, desktop PCs, servers and handheld devices from NEC, visit <http://www.microsoft.com/windows>.

Enterprise Solutions for the Millennium

The NEC Versa, PowerMate, MobilePro and Express5800™ servers are the results of NEC CSD's on-going, innovative approach

[illegible]

SERVER PRODUCTS

Meeting the Demands of Data Analysis

The need to analyze valuable information via decision support systems, data warehouses and data mining applications has driven the demand for cost-effective, NT-based Symmetrical Multi-Processing (SMP) servers with the power to handle the most demanding data analysis tasks. Rapidly growing e-commerce applications have also created a need for these powerful servers.

NEC CSD's answer is the Express5800™ eight-way SMP server based on NEC Corporation's innovative AQUA™ II chipset. This fault-tolerant system —

with high-performance, reliability and capacity — scales to eight Intel Pentium III Xeon™ processors. The AQUA II chipset combines a 128MB L3 cache with Intel's 450NX chipset, allowing the server to scale beyond four CPUs. The HVB600 is designed to work with streamed, sequentially accessed data typically found in highly analytical environments. When pre-loaded with Microsoft® Windows NT® Server 4.0, extending its scalability, interoperability, availability, and manageability, this server product is the ideal solution for large corporations. Windows NT Server 4.0 Enterprise Edition provides the means for building and deploying large-scale distributed applications, making it the best platform for customers' largest

and most mission-critical servers.

System availability is provided by such standard features as hardware RAID, hot-swap disks, hot-plug PCI, redundant hot-swap power supplies and redundant cooling fans. NEC's EMS/PRO Server Management Suite, bundled with every server, monitors critical system functions such as voltage, disk temperature, and memory. In addition, the Management Workstation Application that ships with each HV8600 provides administrators with the ability to remotely monitor, troubleshoot and control the system over the LAN or a dial-up connection.

This highly-scalable and affordable open-system platform features an expandable design with room for eight



1118600

processors, 12 hot-swap disk bays, 11 available cards, and 8GB⁵ of system memory to accommodate additional users and the inevitable growth of the enterprise's database requirements.

1996	1997	1997	1998	1998	1999
Versa 2400 "value-class" notebooks offer 133 MHz Pentium processor.	Versa 6050 ships with Intel's Pentium MMX technology processor.	Versa 6200 Series introduced with 13.3" XGA TFT display.	Versa LX and Versa SX "universal" notebook family feature cross-compatible accessories.	MobilePro handheld computers with 800 x 600 color displays begin shipping.	PowerMate 2000, one of the first microdesktops on the market, is introduced.



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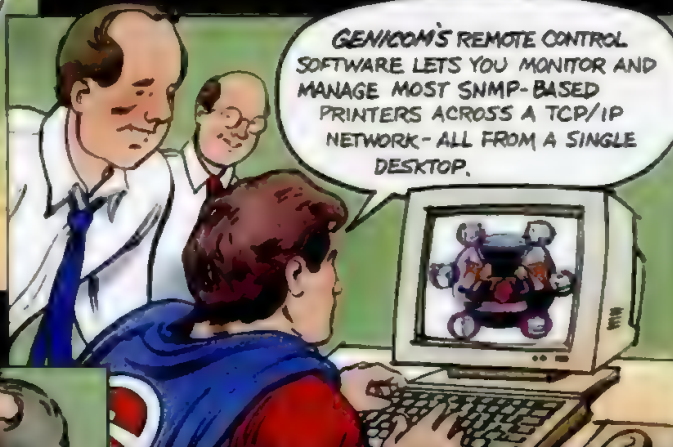


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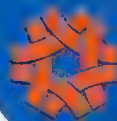
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Taiwan:

Beyond Faster and Cheaper

No longer can Taiwan simply be characterized as the cheaper and faster manufacturing economy of the global IT industry. The Taiwan of today is truly an IT-savvy power, incorporating strong global logistics channels, build-to-order technologies, and some of the best research and development laboratories in the world. Taiwan is creating "Innovalue" — innovation and value for the global IT industry.

Over the past decade, Taiwan's IT companies Original Design Manufacturing (ODM) and Original Equipment Manufacturing (OEM) capabilities have made them the international sourcing center of choice for major industry players including Dell, Compaq and IBM. Recently, many Taiwan firms have moved forcefully into Own Brand Manufacturing (OBM), taking on established European and U.S. companies on a global scale, while still maintaining strong links and partnerships with large multinationals. The software and Internet-based industries have also added to Taiwan's IT value chain.

Taiwan's IT industry: 1999 Overview

In the first six months of 1999, notebooks and monitors led Taiwan's hardware industry, with production value rising 23.21% and 32.67% respectively (see *table* below). The software industry is now realizing the dividends of heavy investment and development over the last few years. The Market Intelligence Center (MIC), under the Institute for Information Industry (III), estimates that the market scale of Taiwan's information service industry will rise 27% this year to about US\$2.9 billion (see *table* below).

Taiwan: International Sourcing Center

Foreign IT orders have continued to soar in 1999 due to Taiwan's unequalled manufacturing capability in build-to-order (BTO) and ODM, which facilitate shorter product lifecycles. In addition, 98% of Taiwan's companies are small- to medium-sized, highly-flexible enterprises.

The demand for low price computers has led many International Purchasing

Continued on next page

The Taiwan of today is truly an IT-savvy power, incorporating strong global logistics channels, build-to-order technologies, and some of the best research and development laboratories in the world.

1999 Taiwan Industry Summary / January - June

	Notebook PC		Monitor		Motherboard		Desktop PC		Scanner		CD-ROM Drive	
	Q2	H1	Q2	H1	Q2	H1	Q2	H1	Q2	H1	Q2	H1
Volume 1998	1295	2496	10,333	20,963	10,037	22,547	2790	5696	3135	6555	6895	13,715
1999	2162	4096	12,985	26,931	13,545	27,632	4021	8116	4803	10,114	9996	19,226
Growth Rate	66.95%	64.10%	25.67%	28.47%	35.0%	22.6%	44.12%	42.49%	53.2%	54.3%	44.97%	40.18%
Value 1998	1991	3783	1516	3235	830	1810	1365	3124	177	392	310	643
1999	2487	4661	2065	4292	963	1989	1554	3254	203	436	330	644
Growth Rate	24.91%	23.21%	36.21%	32.67%	16.0%	9.9%	13.85%	4.16%	14.7%	11.2%	6.5%	0%

Remark: The Motherboard production volume and production value figures exclude motherboards inside systems supplied by vendors like Acer, First International Computer, and Mitac.

Source: The Marketing Intelligence Center (MIC), under the Institute for Information Industry (III).

Products: Figures are presented for six major Taiwan IT products, including Notebook PC, Monitor, Motherboard, Desktop PC, Scanner, and CD-ROM Drive.

Unit: 1000 pcs/US\$1 million



Offices (IPOs) to increase procurement from Taiwan in 1999, according to the Committee for Information Industry Development (CIID), an agency of the Ministry of Economic Affairs. Matthew Miao, Chairman and founder of MiTac, Taiwan's second biggest PC maker says, "The low-cost PC trend is pressuring Taiwan manufacturers to reduce costs...the CTO, BTO models are now being reversed back to simpler manufacturing models. Logistics is the key to delivering value to the customer."

MIC notes that production volume of desktop PCs increased 42.43% in the first half of 1999. Orders are expected to hit a record high this year.

In 1998, Compaq purchased over US\$5 billion worth of IT products from Taiwan. Orders from IBM, Dell and HP ranged from US\$1.5 billion to US\$2.5 billion each, while purchases from Apple and Gateway ranged from US\$500 million to US\$1 billion each. The MOEA forecasts orders by the top 25 IPOs in Taiwan to hit US\$19.2 billion this year — US\$7 billion from Compaq, US\$3 billion from IBM and Dell, US\$2 billion from HP and US\$1 billion from Apple and Gateway.

Notebook Industry: Number One

Acer, Compal, Quanta and ASUSTek are at the forefront of Taiwan's robust notebook industry, supporting Taiwan's role as the number one manufacturer in the world. Notebook production volume and value increased sharply in the first half of 1999 as the top four vendors, Compaq, Dell, Hewlett-Packard, and IBM continued to place heavy orders with Taiwanese makers (see *table* on previous page). According to MIC, Taiwan notebook production accounted for a remarkable

50% of worldwide production in the second quarter of 1999 — up from 43% in the first quarter. International Data Corporation (IDC) expects this trend to continue beyond 1999, as the top ten North American notebook players outsource not only production, but design functions as well.

Japanese notebook vendors, including Toshiba and Sony, began placing test orders with Taiwanese notebook OEM/ODMs in the second quarter of 1999 — the first time that the two have ever outsourced notebook production.

Software Industry: The Unsung Hero

While dominating the world's information technology output in notebooks, CD-ROMs, motherboards, monitors, scanners and desktops, Taiwanese manufacturers have also begun diversifying into software and Internet-related products. According to a recent MIC estimate, the production value of Taiwan's information service industry will rise 27% this year to about US\$2.9 billion, well above the average rate of 22% over the last five years. The Acer Group, ASUSTek, CMC Magnetics, United Microelectronics, Inventec Corp, and RITEK Corp. have all increased investments in software-related companies this year. Among them, the Acer Group is the most prominent, having already invested US\$100 million in these industries. Acer plans to invest between US\$500 million and US\$1 billion over the next five years, investing in over 100 software companies by 2010.

Foreign companies are stepping up cooperation with local software developers to explore the burgeoning Asian software market. U.S.-based Computer Associates International, Inc. (CA) has formed alliances with Taiwan's

Information Technology Pioneer International, Inc. (ITPI), the Acer Group and Enterprise Management Systems (EMS), to develop regional markets for commercial software and electronic commerce (E-commerce) services. Intel has allied with Trend Micro and eAsia, Cisco with III, and Italian manufacturer, SMEC with UbiSoft.

III estimates that the production value of the Taiwan software industry will rise to US\$14 billion by 2005, with US\$3.5 billion in exports — a massive 10-time increase over 1998.

LCD Industry: A Future Engine of Growth

According to IDC, the current global shortage of LCD products will last well into the second half of 2000.

In 1998, Taiwan produced a total of 295,000 LCD monitors. In the first six months of 1999 alone, Taiwan companies had already produced 885,000 LCD monitors and are expected to ship a total of 1.59 million by year's end. According to the MIC, by the end of 2000, Taiwan production of LCDs, mostly of the thin film transistor (TFT) variety, will rise to 6.17 million units. Taiwan will ultimately claim 50% of global market share. Key monitor producers are Compal Electronics Inc., Acer Peripherals Inc., Chuntex Electronics Co., MAG Technology Co., Lite-on Technologies and Royal Information Electronics Co.

In general, the MIC believes Taiwan's hardware and software industry will continue its robust growth this year, boosting its production value to US\$37.9 billion, marking a 12.8% increase over 1998. In the year 2000, the value will soar further to an estimated US\$43.63 billion with the US\$50 billion barrier expected to be broken in 2001.



The Information Highway starts at Booth S1329AA.

Today, Taiwan produces half of the world's notebooks,
besides most of its monitors, keyboards and motherboards.

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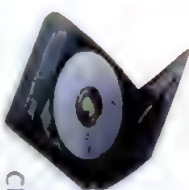
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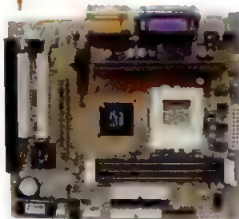
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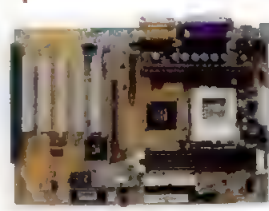
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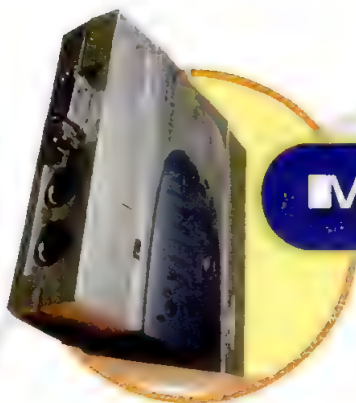
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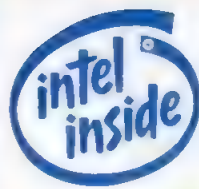
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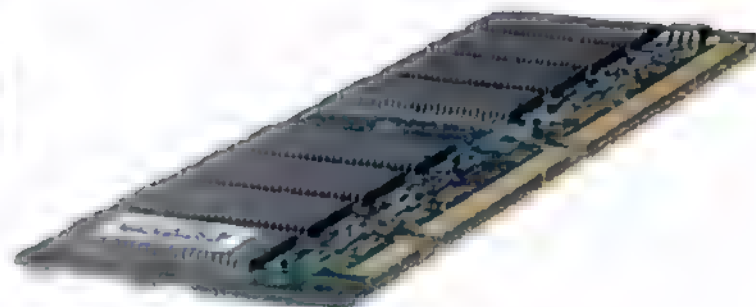
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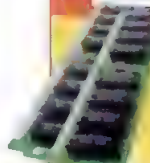
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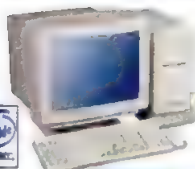
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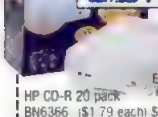
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13.6GB	2MB	7200	\$150
20.4GB	2MB	5400	\$219
20.4GB	2MB	5400	\$219
27.0GB	2MB	5400	\$276
27.3GB	2MB	5400	\$276

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9.1GB	7200	Seagate	ST39140N	\$293
18.2GB	7200	IBM	IBM318350N	\$529

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	18.2GB	7200	Seagate	ST318275LW	\$535
	18.2GB	7200	IBM	IBM318350U2	\$539
	18.2GB	10,000	IBM	IDMVS18U2	\$718
	18.2GB	7200	Seagate	ST318275LW	\$535
	18.2GB	10,000	Seagate	ST318203LW	\$689
	36.4GB	7200	IBM	IDRH3536U2	\$985
	36.4GB	10,000	IBM	IDMVS36U2	\$1227
	36.4GB	7200	Seagate	ST336475LW	\$930
	36.4GB	10,000	Seagate	ST336403LW	\$1177
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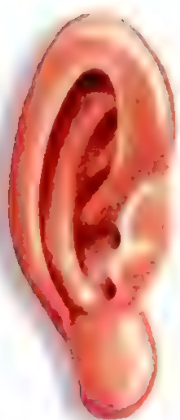
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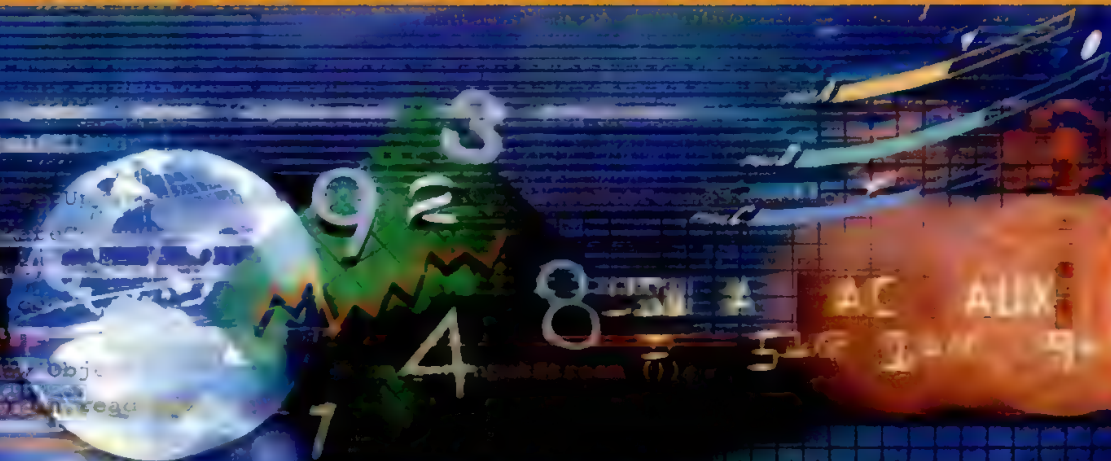
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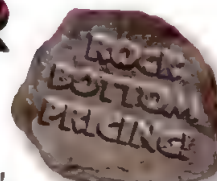
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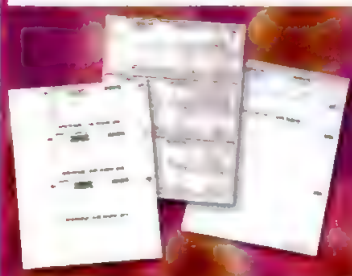


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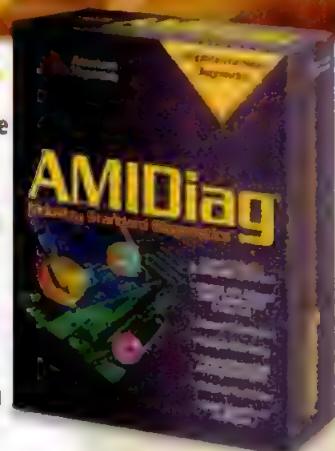
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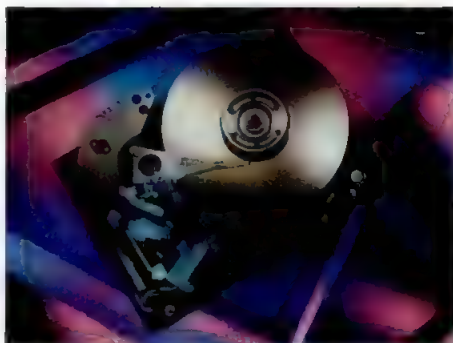
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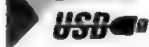
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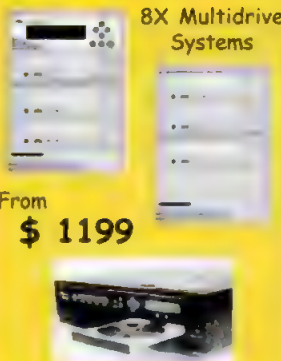
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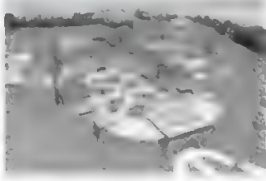
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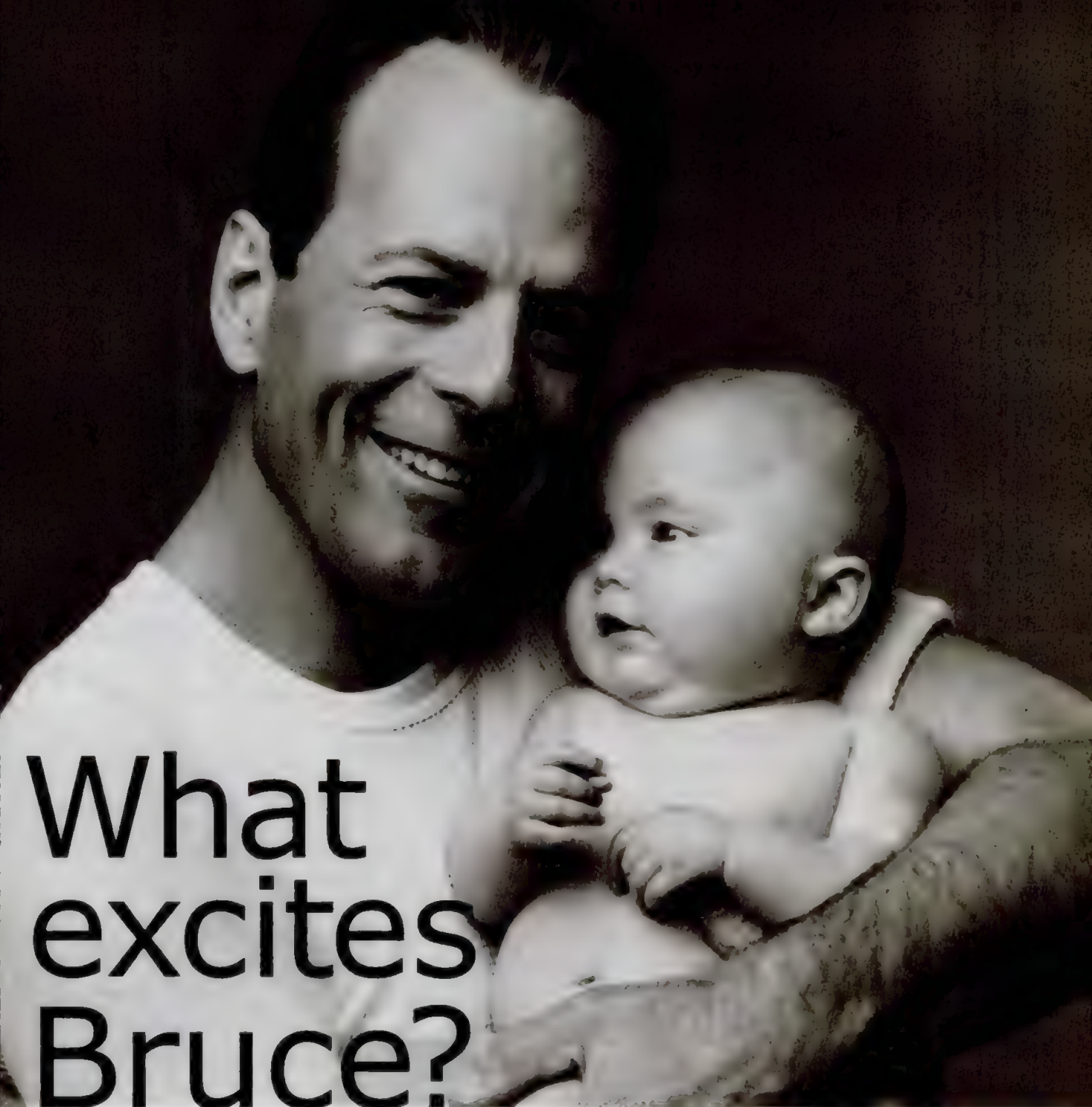
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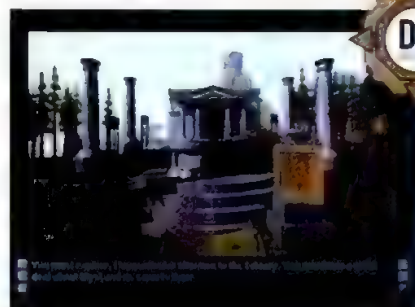
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AFTER HOURS

THE HOME SIDE OF COMPUTING



PHOTO-SHARING WEB SITES

Worth a Thousand Words

By Sally Wiener Grotta and Daniel Grotta

You just got the pictures of the wedding, the new baby, or Janie's first soccer match back from the photo lab and now you want to share them with friends and family dispersed around the globe. Do you go back to the lab and order reprints, then drive to the post office to send them on their way? Not any more. Just log on to the Internet. Dozens of sites have sprouted that let you create and store your photo albums on the Web. Compared with the first album sites, these are far

more affordable: They're free.

We tested four of the leading sites that were open for business at the time of this writing: Adobe ActiveShare.com, Club Photo, PhotoIsland.com, and PhotoLoft. All let you upload pictures into free password-protected photo albums.

Photo-processing companies such as Eastman Kodak, Fuji Photo Film, Konica Photo Imaging, and Seattle Film-Works also offer photo sharing, but these start with a roll of traditional film, which they process, scan, and put online for you for a price. AOL's You've Got Pictures is also currently a

photo-processing site (offered in conjunction with Kodak PhotoNet), but it is planning to have user upload capabilities in the future.

You can expect to see a flurry of new photo sites in the months to come. Hewlett-Packard's cartogra (www.cartogra.com), for example, will be offering similar services, but it wasn't available as of this writing.

Before you can upload your pictures, you'll need to get them into your computer. If you already have a digital camera, you're ahead of the game. If not, you'll need to scan the photos yourself or have your lab put the images on a disk or CD for you. Most photofinishers will do this for about \$5 to \$10 a roll.

Uploading your photos to all four of the reviewed sites is remarkably easy, especially using their free downloadable software. Once you have created your album, you send invitations to your friends and family via e-mail with clickable links to connect to the album. And while they're online, viewers can share their thoughts and reactions in a comments area, or guest book. That's when the excitement really begins.

Because these albums are free, the sites have other ways to generate income. Of course, there is advertising. But more inter-

esting income producers are reprints and photo gift items such as mugs, T-shirts, mouse pads, and even edible cookies, all decorated with your picture.

Before you tell Grandpa to come to the site to see fresh photos of the kids, you'll want to make sure each image looks its best. Image editing and enhancement aren't the purpose of these sites, but the basics, such as flipping, cropping, and auto brightness/contrast, are present—and invaluable. Obviously, one of the differentiating factors among these sites is how effective and easy their editing tools are, but the sites are quite new; none of the ones we looked at offer an entirely smooth process. For instance, not one has batch editing, which is almost always necessary when dealing with “rolls” of pictures. If you want pictures to look their very best, you first should run them through Adobe Photo-Deluxe, Microsoft PictureIt!, or a similar consumer image-editing program.

It's important to remember that these sites are for sharing your photos, not for archiving them. We recommend keeping a copy on your hard disk or in your backup storage system. With the exception of ActiveShare.com, the sites will erase your albums when they become inactive. To avoid that, all you have to do is access your album periodically.

Our Editors' Choice, based on editing, uploading, album management, communications, activities, and gifts, is Club Photo. PhotoLoft runs second, but in this

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Worthy follow-ups to classics. *Page 322.*



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realm of minimal image-editing tools, PhotoLoft doesn't perform even the basic imaging tasks. Remember, though, that this is the very beginning of the category. As more photo-sharing sites come online and others mature, we expect to see a significant improvement in service, quality, and versatility.

upload them one at a time.

The site is powered by eCircles.com, so group e-mails and discussions are simple and fun. You can even set up a group calendar for making dates and reminding other group members about important events, with the option of automatically e-mailing notices to everyone in

offer photo gifts or e-mail greeting cards. The new Adobe PhotoDeluxe 4.0, however, which should be released by the time you read this, is supposed to provide more options (though the software will not be free).

ActiveShare.com could very well grow into one of the premier photo-sharing sites. The drag-and-drop simplicity of its free software combined with the delightful eCircles.com capabilities shows that it is pointed in the right direction.

Club Photo



Club Photo is a well-organized site that provides all the tools you could need to make photo sharing easy and fun. In addition, it is the only site with software for carrying your album on your 3Com Palm organizer.

Living Album, Club Photo's free downloadable program, has Twain acquisition from cameras and scanners and rich



er image editing than ActiveShare.com. But how to proceed in Living Album is not always clear. Further confusing are its "Web page" templates. The templates appear to be part of the Web page design but are never actually exported to Club Photo. An easy-to-use wizard packages your photos, converts them to JPEG format, and sends them to your password-protected or public album. Living Album is even smart enough to update an album by



Adobe ActiveShare.com

Adobe ActiveShare.com is an attractive site that could become a top contender. The free downloadable program ActiveShare allows direct or Twain import of photos from digital cameras or scanners. More important, ActiveShare.com makes it remarkably easy to create numerous albums, batch drag and drop pictures into them, then upload them to the site. No other site achieves these tasks in so few steps.

All image editing is accomplished using the ActiveShare software off-line, and the editing is limited to rotating, cropping, red-eye correction, and (auto) brightness/contrast adjustment. But the editing is time-consuming. Each photo must be corrected individually, and at every click, the tools retreat into a drawer. Also, you can't arrange the order of the photos in the album unless you

your circle. ActiveShare.com will send you notifications of who has visited and when.

At the time of this writing, ActiveShare.com did not yet

Photo-Sharing Web Sites

	Adobe ActiveShare.com	Club Photo	PhotoIsland .com	PhotoLoft
■ YES □ NO				
Free storage	50MB	Unlimited	10MB	20MB
Length of storage time for free albums	Indefinite	90 days after last access	90 days after last access (will send a reminder)	6 months after last access
Premium services	None	Unlimited photos per album, three banner-free albums, more advanced upload software, albums can be made permanent, \$39.95/year	None	30MB additional storage, guaranteed storage, \$29.95/year
Online image editing	□	■	■	■ (cropping only)
Free software for uploading/off-line image editing/cataloging	■ ■ ■	■ ■ □	■ □ □	■ □ □
Direct upload from digital camera or scanner	■	■	□	■ (one at a time)
User can sort order of photos	□	■	■ (online only)	□
User can search by photo caption keyword	■	□	■	■
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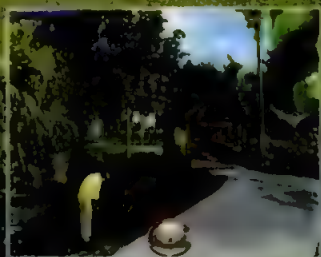
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exporting only new pictures.

Password protection is two-tiered; one tier is for the album owner and the other for the owner's friends and family (with each album assigned a different password, if you want, to control who sees what). The album-owner password gives you access to Club Photo's Album Manager, online software for adjusting and editing images by using very simple, one-click commands.

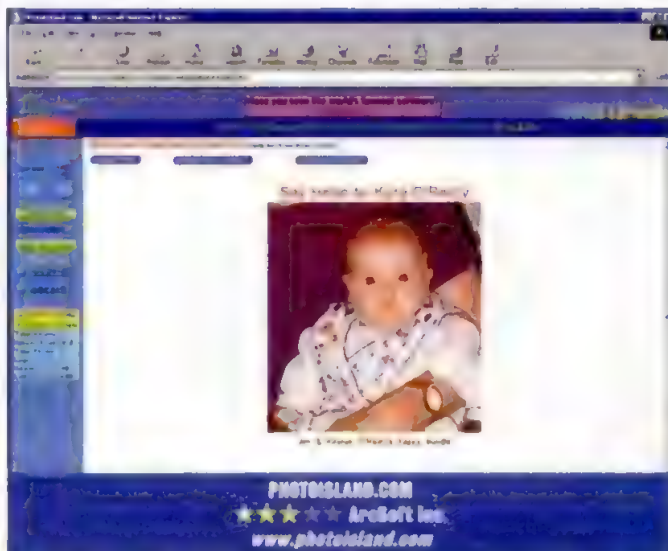
Although the password-protected albums are free, you can choose to have them be public. Or you can pay for the premium service (\$39.95 per year), which gives you three banner-free albums with unlimited pages, plus the Pro version of Living Album, which includes audio and video annotation.

Unique to Club Photo is the free Album to Go software, which lets you download your album to your Palm organizer, where you can view your photos individually or as a slide show.

es on uploading and converting images. The program has a file-organizing interface into which you drag and drop files from Windows Explorer, giving you a quick and easy upload to your online album.

All image editing is performed online (which can be time-consuming, especially if you have a slow connection), and there's no Twain acquisition from scanners or cameras. Editing options include rotating, deleting, and updating captions and keywords (for use by the search engine). You can also change the background of your album, though choices are currently limited.

With two levels of password—one for the album owner, the other for guests—only the owner has access to the editing tools. If you want, you can hide an album so no one else can see it. In addition, you can set rules for whether your guests can use your photos—printing



Club Photo is a good all-round photo-sharing site that provides all the tools you'll need, plus a bit more.

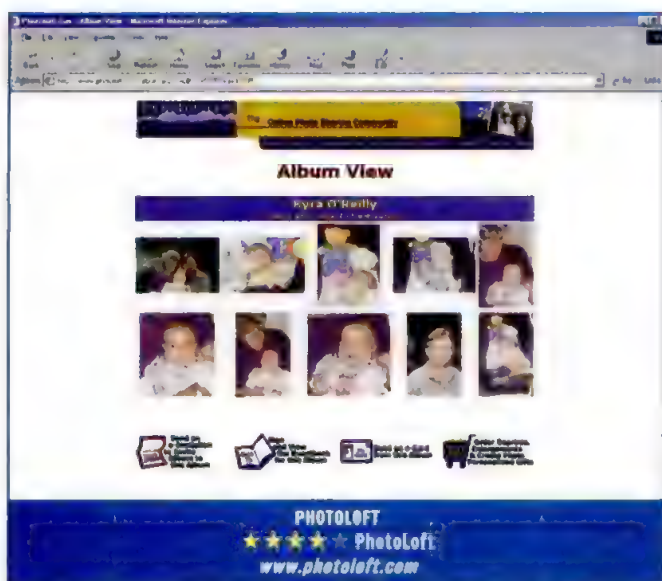
PhotoIsland.com

ArcSoft's PhotoIsland.com is, like the company's image-editing software, lively and lighthearted.

The free downloadable Image Uploader software focus-

them or creating a Photo-Montage poster, a free postcard, or a gift item with them. Your album can be viewed as individual images or a slide show, but for now, the slide show can't be downloaded.

PhotoIsland uses pix.com as its source for photo gift items, so a large variety are available. You can also upload photos directly from your computer to the gift



interface or use one of ArcSoft's stock images. Members of PhotoIsland.com receive discounts on ArcSoft software.

PhotoIsland.com users will suffer from the site's lack of off-line tools, which is especially important to those with slow connections. Otherwise, though, it is a well-designed site. PhotoIsland.com doesn't outshine its competitors, but it does deliver an enjoyable experience.

PhotoLoft

PhotoLoft started out as a searchable public showcase for sharing your photos with the world. Using this database for its core code, PhotoLoft now has free and premium password-protected albums. But what really sets PhotoLoft apart is its use of the FlashPix file format, which enables high-resolution printing from Web photos.

The downloadable software, PhotoLoft.com Upload Client, brings in only one picture at a time from your Twain-compatible device. But it does offer captioning and tools for rotating, cropping, and flipping (though not sorting) your photos.

A one-button click in the interface is supposed to launch your image editor (if you have one on your system), though we had difficulty making it work.

Uploading your files is a multi-step operation, including selecting database categories, naming your album, and setting passwords. Or if you click on an on-site e-mail upload button, PhotoLoft launches a new e-mail message, to which you can attach pictures. PhotoLoft will then notify you when they have been posted.

Once a photo has been uploaded, your options are limited. But one unique PhotoLoft tool is the code for linking any album photo into an online auction page, such as eBay. And because PhotoLoft uses the FlashPix format, which stores several versions of the image at different resolutions in the file, you can use the Enhanced Active Viewer to zoom in for more detail and pan around.

The downloadable Photo Quality Printing Software lets you create photo-quality prints from your desktop printer. Your original photo, however, must already have sufficient data in its file. PhotoLoft does not *interpolate* (or artificially enhance) picture data.

PhotoLoft is a high-powered site with a focus on service and quality. Obviously setting its vision farther than just family photo sharing, it still provides a solid framework of tools and features for family and friends.

area 51



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STRATEGY AND ADVENTURE GAMES

Two Sequels to Classics

By Michael E. Ryan

Users got hooked on Westwood Studios' Command & Conquer and Electronic Arts' System Shock. Now it's time for the next generation.

Command & Conquer Tiberian Sun

The long-awaited follow-up to one of the first real-time strategy games, Command & Conquer Tiberian Sun is a solid



game that should please fans of the original Command & Conquer. Though it offers far less technological innovation than its predecessor, the game does serve up more of the addictive real-time game play that made Command & Conquer so popular.

Whereas Command & Conquer was set in the very near future and its prequel Red Alert in the past, Tiberian Sun's action takes place in the year 2030. The two combatant forces of the original game—the Global Defense Initiative (GDI) and the Brotherhood of Nod—are at each other's throats once more. Game players can choose to play either side in the conflict, taking their orders from General Solomon (voiced by James Earl Jones) with the GDI and the enigmatic Kane with the Nod.

The game play is almost

exactly like that of previous Command & Conquer titles. Regardless of which side you choose, you must fight through a series of missions by assembling bases, training troops, and destroying the enemy, mining Tiberium to pay for it all. Your forces can include basic infantry and scout vehicles as well as tanks, aircraft, and special agents capable of devastating commando attacks. Some of the game's most important new features

include way-point commands for moving your units and assigning

status for experienced, more effective units.

The graphics in Tiberian Sun are significantly better than those in previous Command & Conquer games. The units are 2-D animated sprites, but the terrain is made up of lush, 3-D landscapes. Colored lighting adds plenty of atmosphere to most battlefields, and the animated explosions and other special effects can be quite spectacular.

As with the original Command & Conquer, Tiberian Sun offers great multiplayer support for games over modem, IPX networks, and the Internet. The skirmish mode lets you hone your skills for multiplayer matches by fighting multiple computer foes.

Essentially, Command & Conquer Tiberian Sun is the same game as Command & Conquer with a few new features and a much-improved

graphics engine. This latest title in the Command & Conquer series should appeal to longtime fans and newcomers alike.

System Shock 2

When the original System Shock was released, DOOM and other first-person shooters dominated the gaming scene. Combining a deep story and cerebral game play with a first-person perspective therefore made System Shock a unique action-adventure title for the time. System Shock 2 also delivers a memorable plot and unique puzzles, but it does not quite live up to the classic status of its predecessor.

An alien virus has taken control of mankind's first faster-than-light spacecraft and—worse yet—is taking control of your once-human comrades. Armed with only your wits, you must attempt to restore power to the ship, track down the source of the problem, and eliminate it.

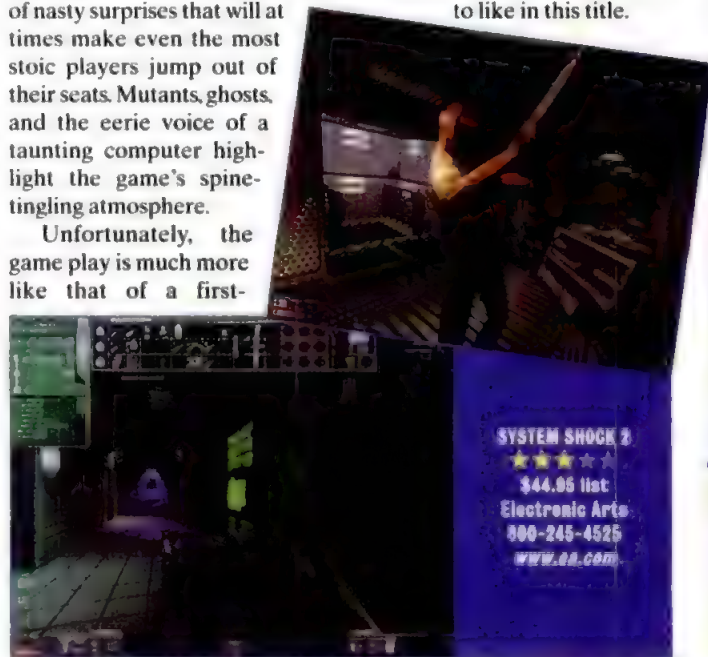
Graphically, the game looks like a typical first-person shooter, with an impressive 3-D engine, excellent lighting effects, and well-designed levels that effectively set the stage for the game's action. The story is quite spooky, and the game play is full of nasty surprises that will at times make even the most stoic players jump out of their seats. Mutants, ghosts, and the eerie voice of a taunting computer highlight the game's spine-tingling atmosphere.

Unfortunately, the game play is much more like that of a first-

person shooter than it probably should be. Though you have three different options for approaching the game—as a soldier, a computer specialist, or a psi-specialist (someone with special mental powers)—the action boils down to brute-force methods more often than not. Shotgun-toting mutants and killer monkeys (yes, monkeys) come at you with a frequency and determination that will challenge even veteran action fans. This is not necessarily a bad thing, but it may disappoint fans of the original game, which relied much less on shoot-'em-up action.

To make matters worse, the game's interface often gets in the way of the action. You can't move when you pull up your all-important inventory menu, so you often get jumped by bad guys and wind up getting killed before you can even exit the menu screen.

Still, there's no questioning the quality of the atmosphere created in System Shock 2. This is one of the scariest and most compelling games we've seen in a while. We were not as impressed by the game's action-heavy game play, but first-person shooter fans will find plenty to like in this title.



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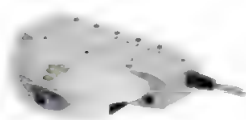
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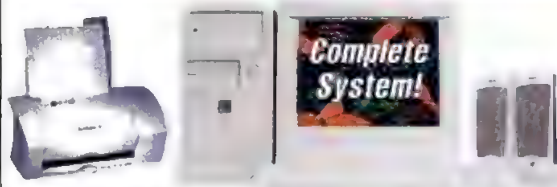
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Alfred E. Neuman Bytes!

By Jay Munro

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Though *MAD* magazine and its mascot (introduced in December 1956), Alfred E. Neuman, are known worldwide, the intro covers *MAD* history from the days when the comic book sold for a mere 10 cents.

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Answers to Stupid Questions" can be selected from a master list and then narrowed with a keyword search. Context-sensitive help is always available in case you need it.

In case you simply want to browse, the collection is arranged chronologically and by cover art thumbnails. *Totally MAD*'s Veeble-fetzer is where you'll probably spend most of your time. It's the *Mad* version of a browser, with quick access for searching, viewing covers or the table of contents of the issue you're looking at, zooming, and more. You can print out selected pages in color or black and white, printing entire pages or just the sections you want. The pages are high-resolution bitmaps, so be sure your printer has enough memory to handle them.

When you're viewing a particular issue, navigation buttons let you page through the issue, jump to the cover, and bookmark your favorites for later viewing. For serious research (yeah, sure),

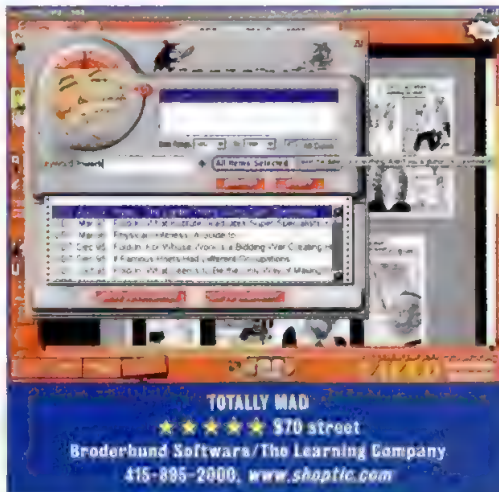
any number of lists can be saved, recalled, and copied to help you organize content better. With the zoom, scroll bars, and "hand grab" features of the Veeble-fetzer, you can easily view pages on a small monitor, but you will probably want to upgrade to a larger one. And if you jump around a lot, you'll probably wish you had a CD jukebox.

MAD does, however, have its own jukebox, which brings up *MAD* radio spots, animated *MAD* Toons, and *MAD* Music, a

Whether you're going through old issues or playing the jukebox, you'll randomly see the *MAD* Zeppelin wander across the screen. Click on it and you'll be treated to a surprise showing of an interview, song, or animation to break up your concentration.

Now, if you're checking out *Totally MAD* and don't want someone approaching you to see what you're doing, hit the Panic button. Somewhat like the old "boss key," it randomly pops up a word processing screen or an "Miyoursoft Ecch-sel" chart on something like "The Most Common Ailments in the Republic of Cupinluck" or a survey of "The Least Popular Meats in America."

The easy interface and good performance as well as the full collection of issues, specials, music, and all the rest make *Totally MAD* a lot of fun for 70 bucks. But wait, there's more: Each collection comes with its own roll of *MAD* toilet paper! If you or someone you know is a *MAD* magazine fan, the *Totally MAD* CD collection is a must-have. Now if only Broderbund would release *Totally MAD* on a single DVD! **PC**



collection of parodies and just weird songs such as "She Got a Nose Job." Fans who want to look deeper into the psyche of *MAD* can watch video interviews of the UGOI (Usual Gang of Idiots), otherwise known as the staff.

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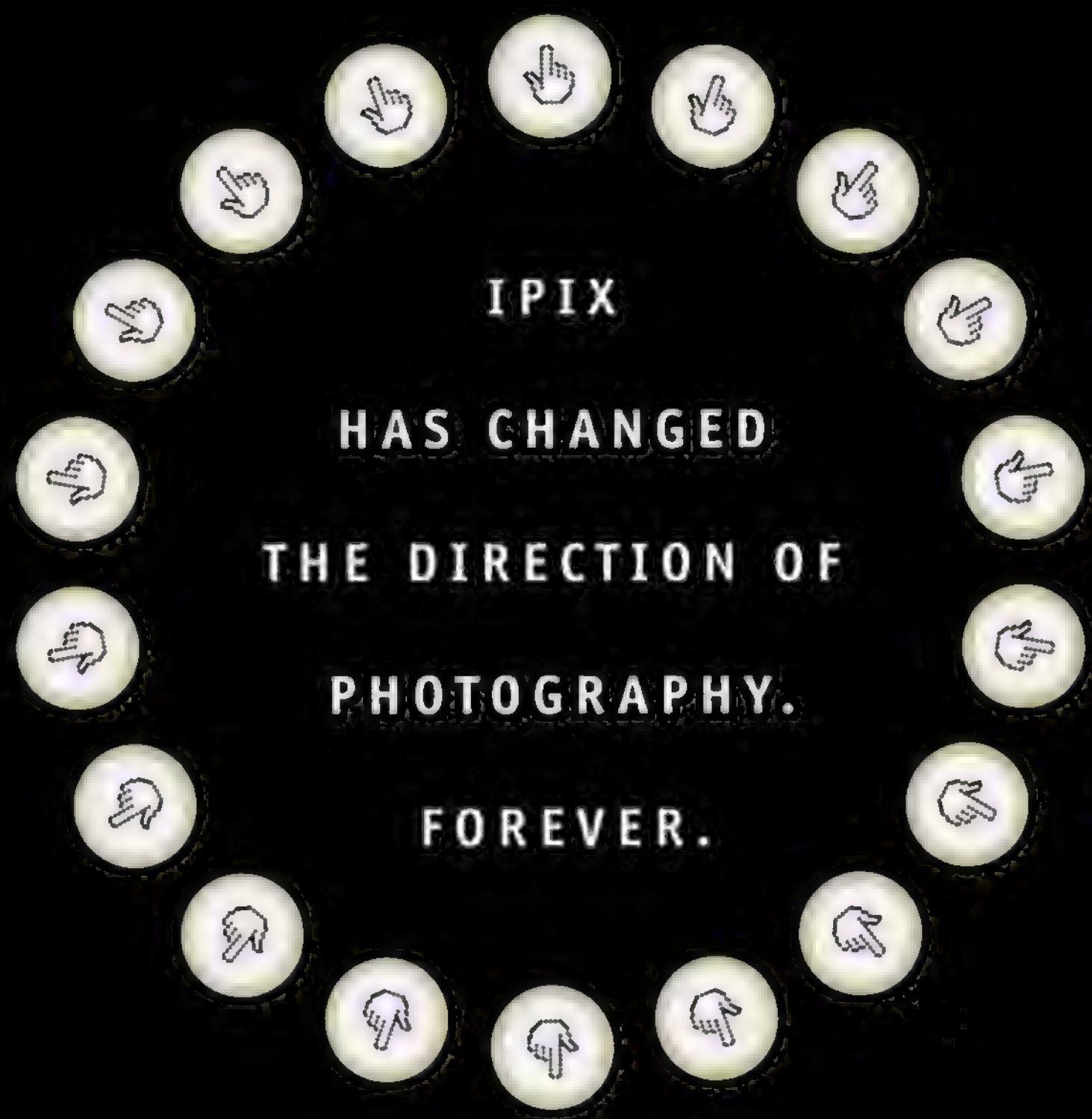
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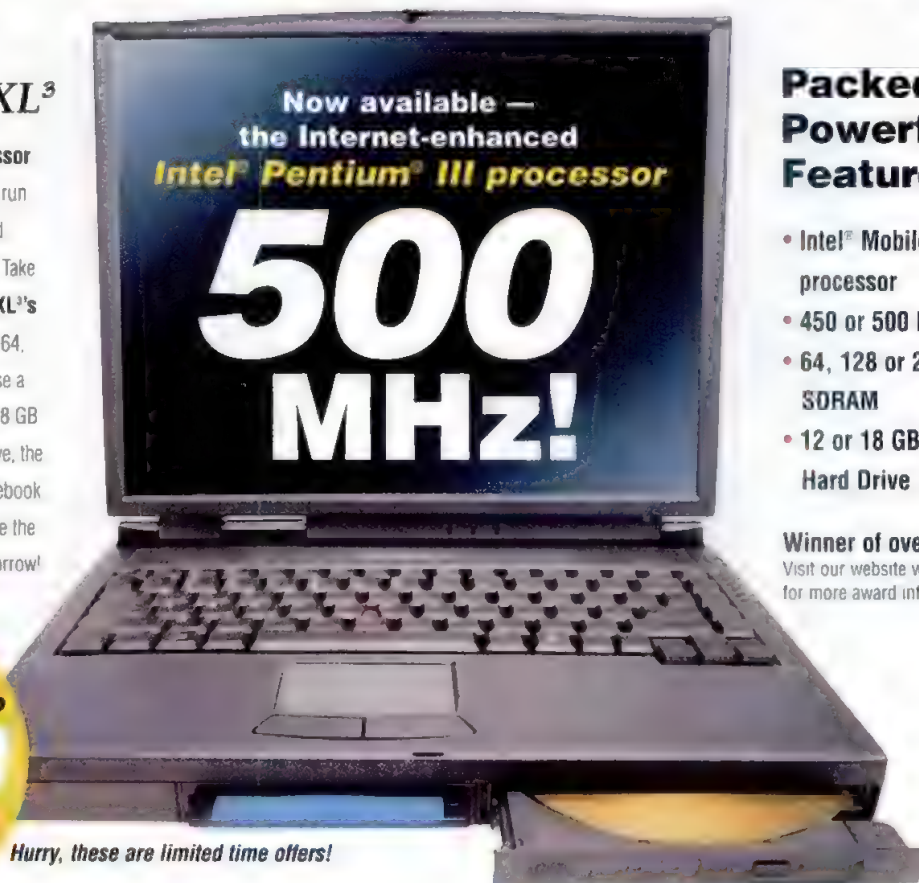
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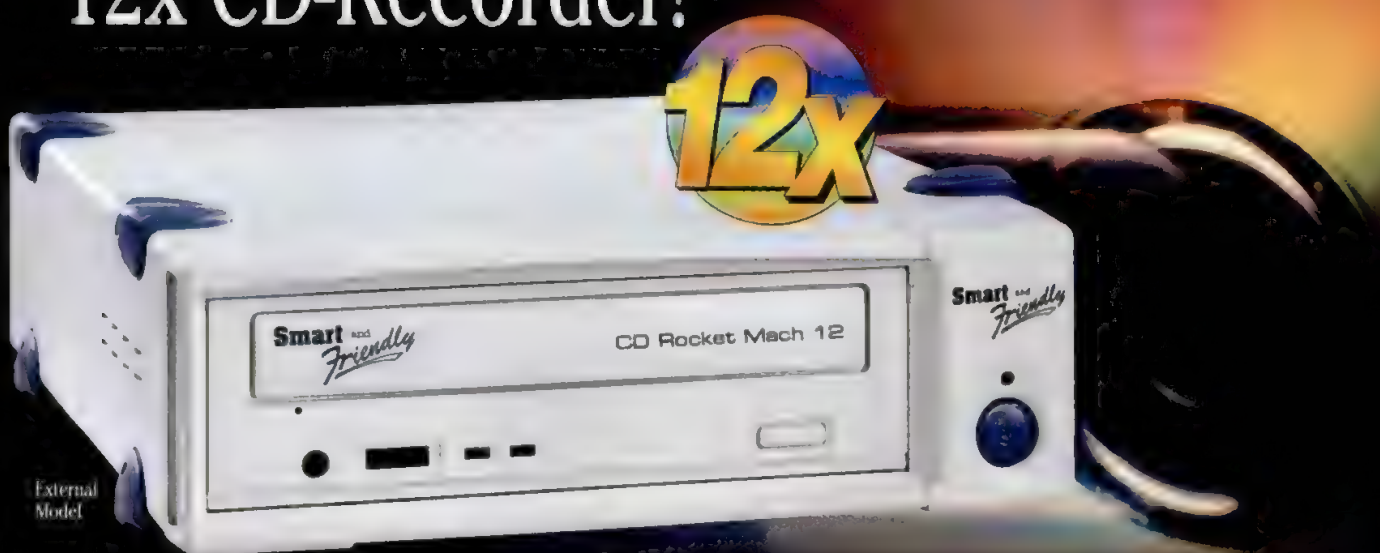
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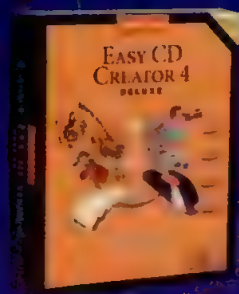
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CTXTM55A	AMD K6-2/400 3DNow!	15"	64MB PC 100	6.4GB UDMA	40X	AGP/8MB	Micro-ATX	\$19/Month	\$629.99 \$229.99
CTXTM56B	AMD K6-2/475 3DNow!	15"	64MB PC 100	8GB UDMA	40X	AGP/8MB	Micro-ATX	\$21/Month	\$689.99 \$289.99
CTXTM50B	Celeron 400MHz	15"	64MB PC 100	8GB UDMA	40X	AGP/8MB	Mid-Tower	\$22/Month	\$719.99 \$319.99
CTXTM57B	AMD K6-2/400 3DNow!	15"	128MB PC 100	12GB UDMA	40X	AGP/8MB	Micro-ATX	\$24/Month	\$789.99 \$389.99
CTXTM51A	Celeron 500MHz	15"	96MB PC 100	8GB UDMA	40X	AGP/8MB	Mid-Tower	\$27/Month	\$899.99 \$499.99
CTXTM39A	AMD K6-III/400 3DNow!	17"	128MB PC 100	12GB UDMA	40X	AGP/8MB	Mid-Tower	\$30/Month	\$999.99 \$599.99
CTXTM42C	Pentium III 450MHz	17"	128MB PC 100	12GB UDMA	40X	AGP/8MB	Mid-Tower	\$33/Month	\$1069.99 \$669.99
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CTXTM45C	Pentium III 550MHz	17"	96MB PC 100	20GB UDMA	40X	AGP/8MB	Mid-Tower	\$42/Month	\$1399.99 \$1399.99
CTXTM46B	Pentium III 600MHz	17"	128MB PC 100	13GB 7200 RPM UATA/66	40X	ATI Xpert 128/16MB	Mid-Tower	\$47/Month	\$1539.99 \$1139.99
CTXTM52A	Pentium III 667MHz	17"	128MB PC 100	18GB 7200 RPM UATA/66	40X	Voodoo 3 2000/16MB	Mid-Tower	\$53/Month	\$1759.99 \$1359.99
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(The Baltimore Sun.)

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a monitor. (Sears ad.)

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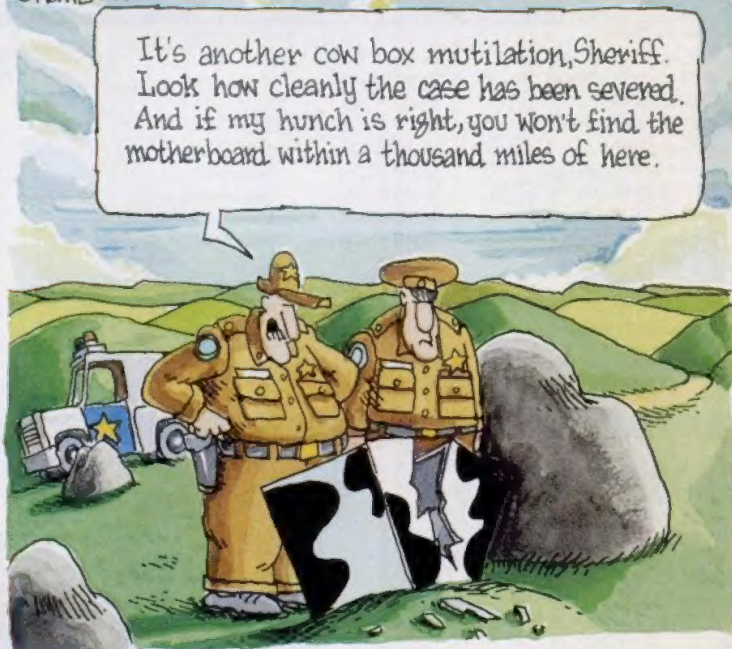
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graceful
juxtaposition
in the MSNBC
news feed.

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Murray dies
'Dateline': Surgery puts
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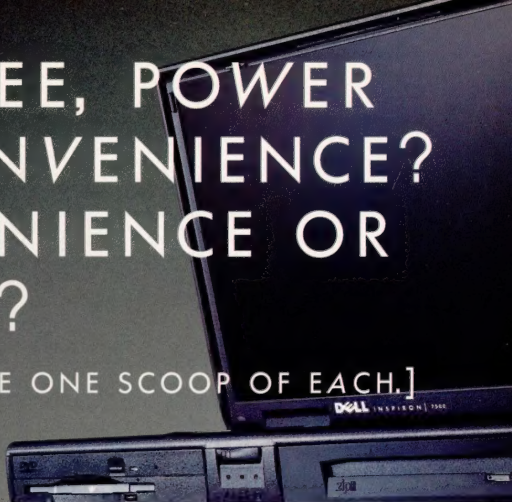
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